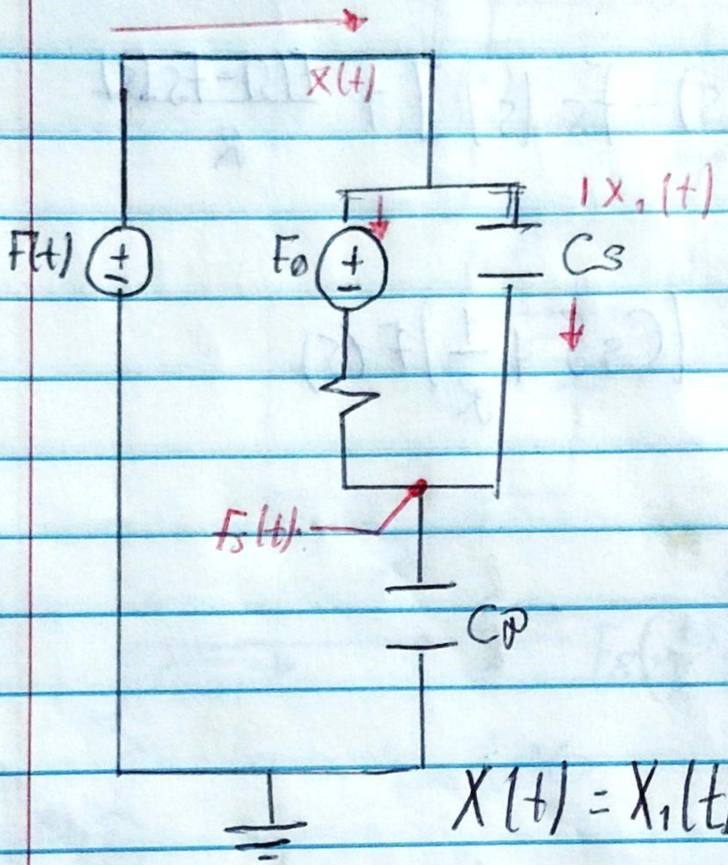
Circuito eléctrico

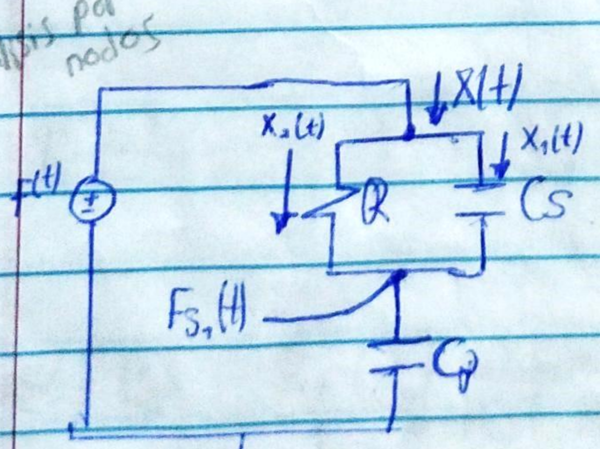


$$X(t) = X_1(t) + X_2(t)$$

Función de transferencia *Se aplica superposición

Análisis apagado F_0

* Análisis por nodos

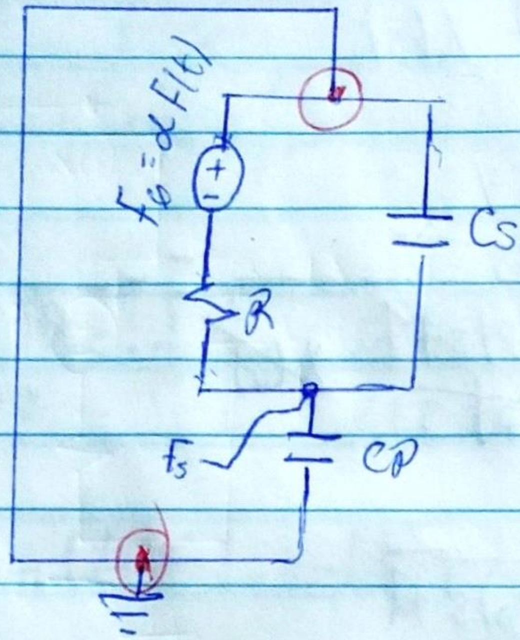


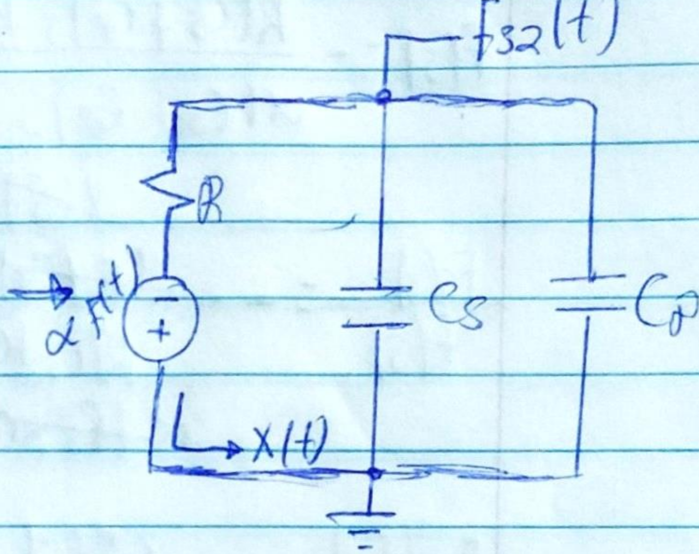
$$X(t) = X_1(t) + X_2(t)$$

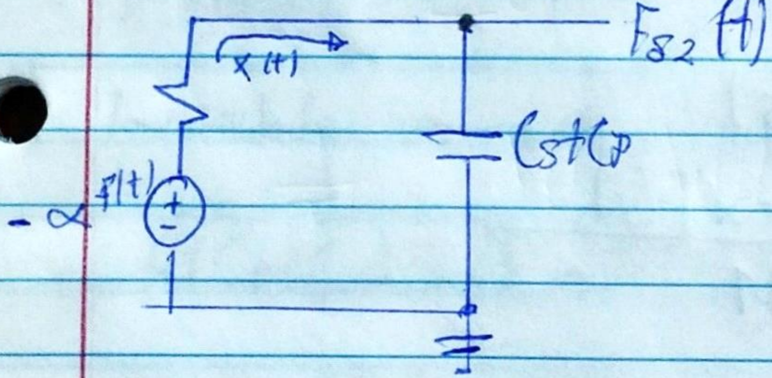
$$X(t) = \frac{d[Fs(t)]}{dt}$$

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

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







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

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

$$\alpha F(s) = \frac{R_x(s)}{1} + \frac{X(s)}{(C_s + C_p)s} \quad ; \quad F_s(s) = \frac{X(s)}{(C_s + C_p)s}$$

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

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

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

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

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

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

Error en estado estacionario

Entrada

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

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

$$e(s) = 1-\left(\frac{1-\alpha}{1}\right) = 1-(1-\alpha) = \cancel{1}-\cancel{1}+\alpha = \alpha = 0.25$$

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

Estabilidad lazo abierto

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

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

$$\lambda = -\frac{1}{R(C_p+C_s)S} \qquad \mathrm{Re}\ \lambda < 0$$

∴ El sistema presenta una respuesta asintoticamente estable.