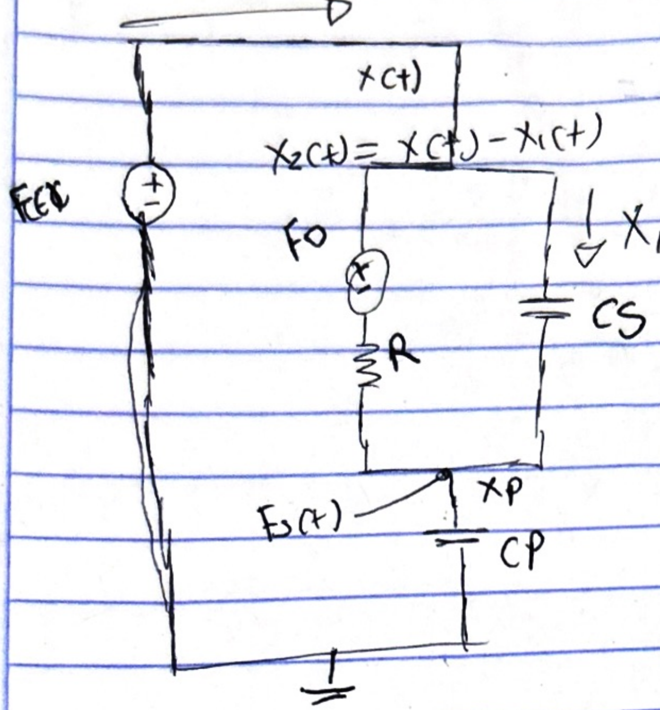
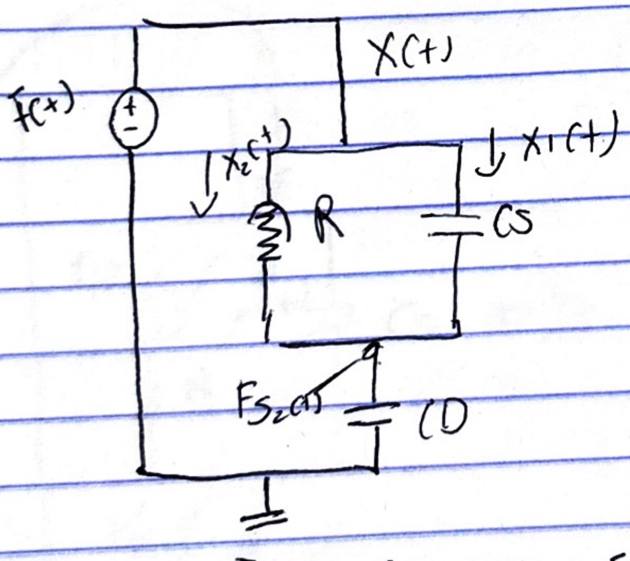
## Circuito eléctrico

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




## Funcion de transferencia

Analisis apagando Fo




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

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

$$x_1(t) = Cs\frac{d[F(t) - Fs(t)]}{dt}$$

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

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

$$(CPs + CSs + \frac{1}{R})Fs(s) + (CSs + \frac{1}{R})FS$$

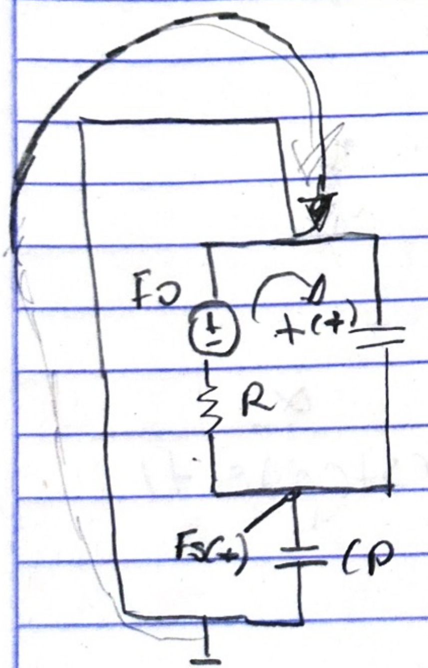
$$\frac{F_s(s)}{F(s)} = \frac{C_s S + \frac{1}{R}}{C_p S + C_s S + \frac{1}{R}}$$

$$= \frac{\frac{C_s S R + 1}{R}}{\frac{C_p S + C_s S R + 1}{R}} = \frac{\frac{C_s S + 1}{R}}{\frac{C_p S R + C_s S R + 1}{R}}$$

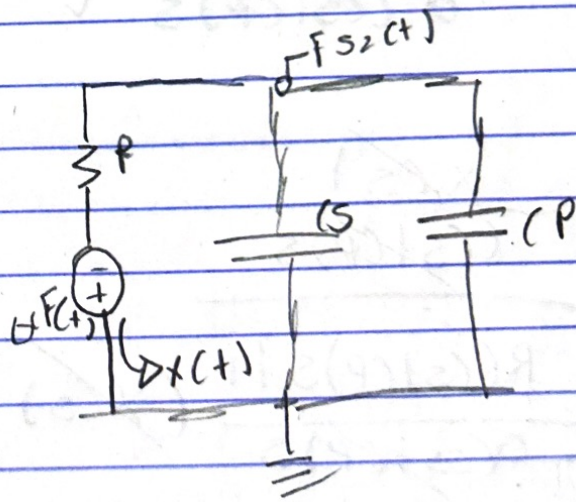
$$= \frac{C_s S R + R}{C_p S R^2 + C_s S R^2 + R}$$

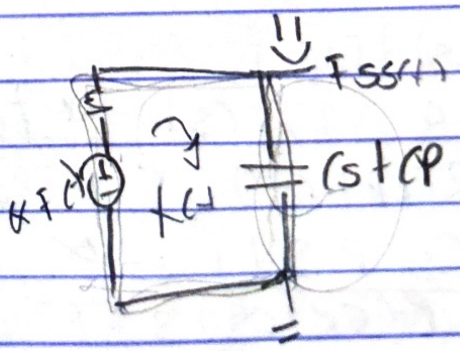
$$= \frac{R(C_s S R + 1)}{R(C_p S R + C_s S R + 1)}$$

$$= \frac{C_s S R + 1}{C_p S R + C_s S R + 1}$$




$\Rightarrow$




$$X(t) = \frac{-\alpha F(t)}{R}$$

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

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

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

$$F_s(s) = \frac{X(s)}{(C_s + C_P)s}$$

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

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

$$\frac{F_s(s)}{F(s)} = \frac{\frac{\cancel{X(s)}}{\cancel{(C_s + C_P)s}}}{\frac{R(C_s + C_P)s + 1}{-\alpha \cancel{(C_s + C_P)s}} \left( \cancel{X(s)} \right)} = -\frac{\alpha}{R(C_s + C_P)s + 1}$$

$$F_s(s) = F_{s1}(s) + F_{2}(s)$$

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

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

Error en estado estacionario

$$e(s) = \lim_{s \to 0} s\, f(s) \left[ 1 - \frac{\cancel{CSRS+1} - \alpha}{\cancel{R(CS+CP)S+1}} \right]$$

$$\cancel{s} \circ \frac{1}{\cancel{s}}$$

$e(s) = \alpha$

$e(t) = \alpha$ ✓

Estabilidad en lazo abierto

$R(CP + CS)S + 1 = 0$

$$X = -\frac{1}{R(CP+CS)}$$