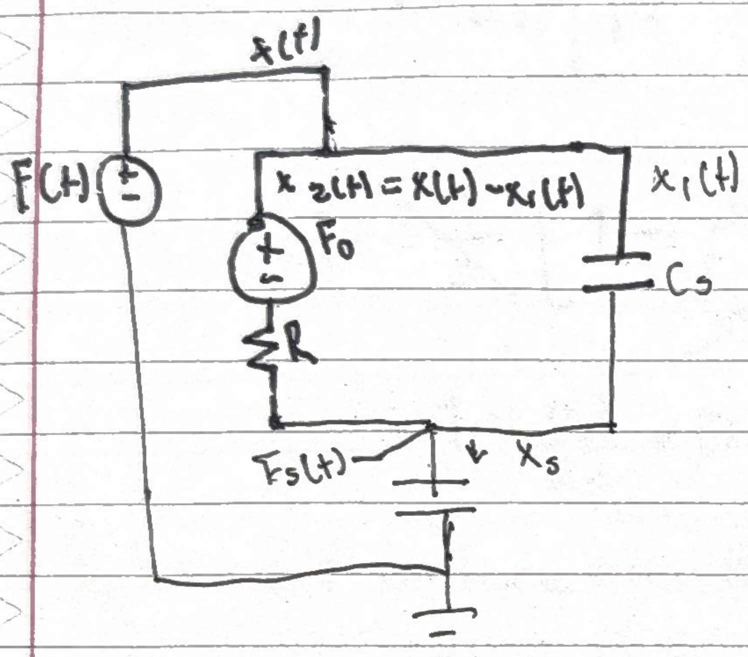
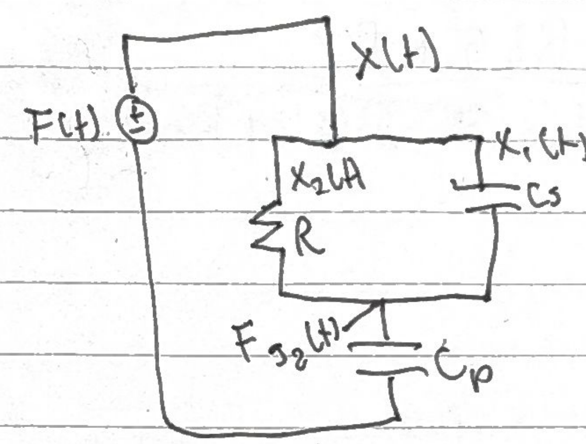
Circuito electronico



Función de transferencia

Analisis apagando Fo



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

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

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

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

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

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

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

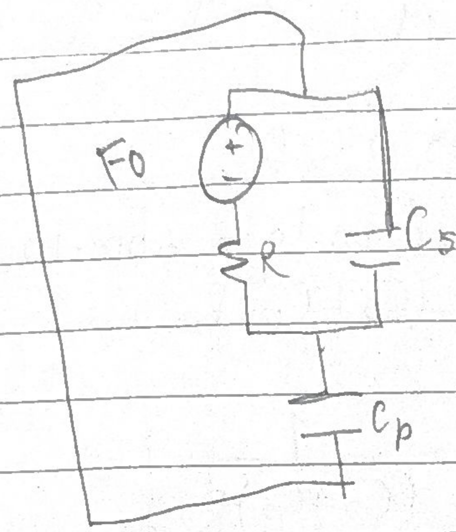
$$\frac{C_s R S + 1}{R}$$

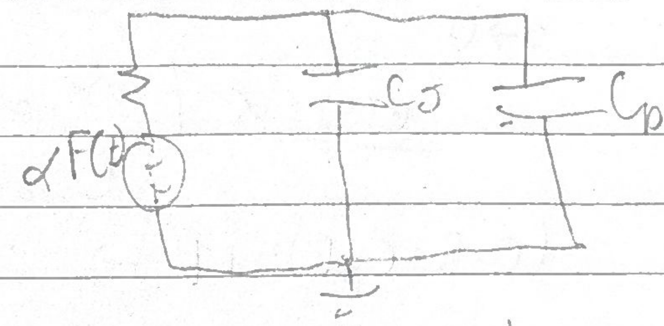
$$\left(C_p S + C_s S + \frac{1}{R}\right) F_s(S) = \left(C_s S + \frac{1}{R}\right) F(S)$$

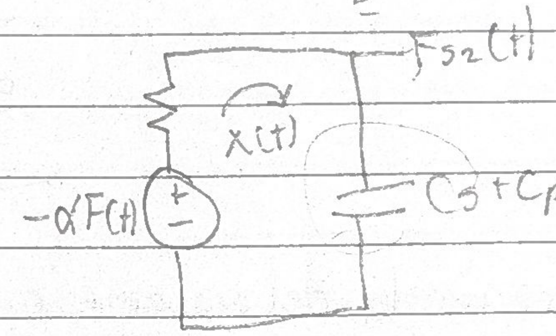
$$\boxed{\frac{F_s(S)}{F(S)} = \frac{C_s S + \frac{1}{R}}{(C_p + C_s)S + \frac{1}{R}}}$$

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

Error estacionario







$F_s(s)$

$$-\alpha F(t) = R\,X(t) + \frac{1}{C}\int X(t)\,dt$$

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

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

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

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

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

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

$$F_{s2}(t) = (C_s+C_p)\frac{d(-\alpha F(t))}{dt} -$$

$-\alpha F(t)$

$X(t) =$

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

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

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

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

$$\frac{C_s R s + 1 - \alpha}{R((C_s + C_p)s + 1} = \text{Error en estado estacionario}$$

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

$$e(s) = \alpha; \rightarrow \alpha V \rightarrow 0{,}25$$

Estabilidad en lazo abierto

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

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

La respuesta del sistema es asintóticamente estable

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