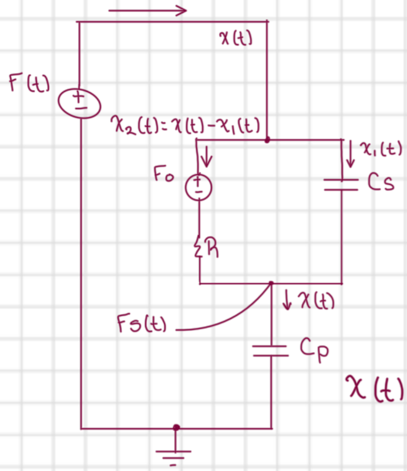
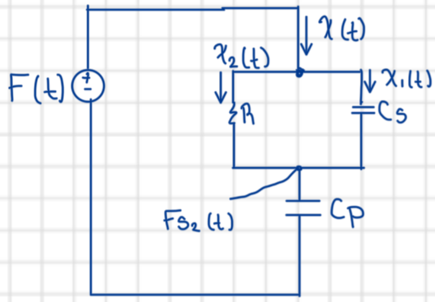
Circuito eléctrico



$$\chi(t)=\chi_1(t)+\chi_2(t)$$

Función de transferencia (Análisis apagando Fo)



$$\chi(t)=\chi_1(t)+\chi_2(t)$$

$$\chi(t)=C_p\frac{d[F_s(t)]}{dt} \qquad \chi_1(t)=C_s\frac{d[F(t)-F_s(t)]}{dt}$$

$$\chi_2(t)=\frac{F(t)-F_s(t)}{R}$$

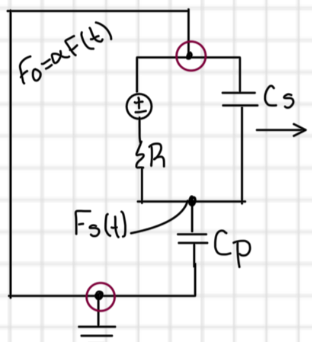
$$C_p\frac{dF_s(t)}{dt}=C_s\frac{d[F(t)-F_s(t)]}{dt}+\frac{F(t)-F_s(t)}{R}$$

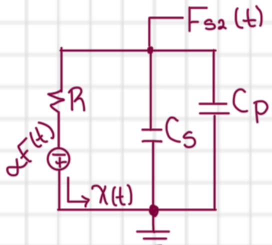
$$C_p S F_s(S)=C_sS[F(S)-F_s(S)]+\frac{F(S)-F_s(S)}{R}$$

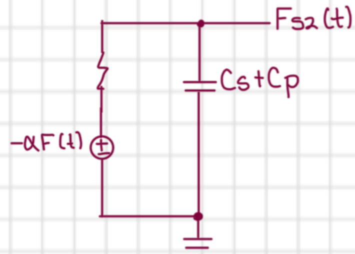
$$\left(C_pS+C_sS+\frac{1}{R}\right)F_s(S)=\left(C_sS+\frac{1}{R}\right)F(S)$$

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

$$\boxed{F_{s_1}(S)=\frac{(C_sRS+1)F(S)}{R(C_s+C_p)S+1}}$$







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

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

$$-\alpha F(S)=R\chi(S)+\frac{\chi(S)}{(C_s+C_p)S}$$

$$F_s(S)=\frac{\chi(S)}{(C_s+C_p)S}$$

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

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

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

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

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

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

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

Función de transferencia

Error en estado estacionario

$$e(s) = \lim_{s \to 0} \frac{1}{s} \cdot \left[1 - \frac{R(C_p + C_s)s + 1}{R(C_p + 2C_s)s + (2-\alpha)} \right] = 1 - 1 + \alpha = \alpha$$

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

Estabilidad en lazo abierto

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

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

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

∴ La respuesta es asintoticamente estable.