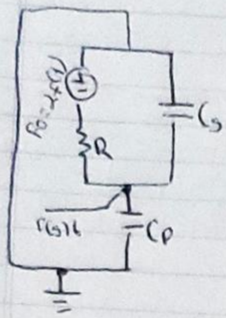
Modelado de sistemas fisiologicos

23/10/18

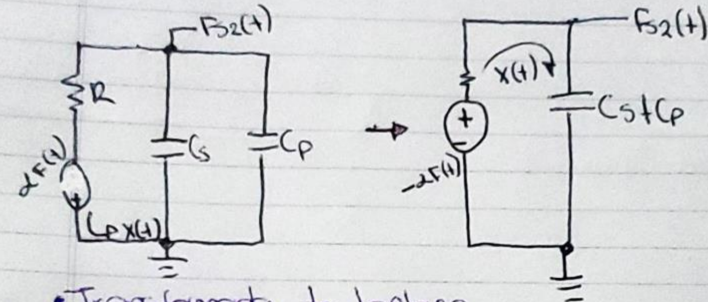


$$\frac{F_S(S)}{F(S)} = \frac{C_S R_S + 1}{R(C_S + C_P)S + 1}$$

$$F_{S1}(S) = \frac{(C_S R_S + 1)\, F(S)}{R(C_S + C_P)S + 1}$$

① $\frac{R C_S S + 1}{R(C_P + C_S)S + 1}$

② $\frac{1}{1 + R(C_S + C_P)S}$



• Ecuaciones Principales

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

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

• Transformada de laplace

$$-\alpha F(S) = R X(S) + \frac{X(S)}{(C_S + C_P)S}$$

$$F_S(S) = \frac{X(S)}{(C_S + C_P)S}$$

$$F(S) = -\frac{R(C_S + C_P)S + 1}{\alpha (C_S + C_P)S}\, X(S)$$

$$\frac{F_S(S)}{F(S)} = \frac{\frac{\cancel{X(S)}}{\cancel{(C_S + C_P)S}}}{\frac{R(C_S + C_P)S + 1}{\cancel{\alpha (C_S + C_P) S}}\, X(S)} = \frac{\alpha}{R(C_S + C_P)S + 1}$$

$$F_{S2}(S) = \frac{-\alpha F(S)}{R(C_S + C_P) + 1}$$

$$F_S(S) = F_{S1}(S) + F_{S2}(S)$$

$$F_S(S) = \frac{(C_S R_S + 1)\, F(S) - \alpha F(S)}{R(C_P + C_S)S + 1}$$

$$\frac{F_S(S)}{F(S)} = \frac{C_S R_S + 1 - \alpha}{R(C_P + C_S)S + 1}$$

24/10/25

Sistema musculoesquelético

* Estabilidad del sistema en lazo abierto

$[RC_P + RC_S]S + 1 = 0$

- Es de 1er orden se despeja "S"

$$S = -\frac{1}{RC_P + RC_S}$$

Tabla de valores		
Parámetro	Control	Caso
$r(t)$	1 V	1 V
α	0.25	0.25
C_S	10μF	10μF
C_P	100μF	100μF
R	100Ω	10KΩ

- Cálculo de los Polos

A) Control

$$S = -\frac{1}{(100)(100\times10^{-6}) + (100)(10\times10^{-6})}$$

$\lambda_1 = -90.909$ //

B) caso

$$S = -\frac{1}{(10000)(100\times10^{-6}) + (10000)(10\times10^{-6})}$$

* El sistema tiene una respuesta estable (asintótica)

$\lambda_2 = -0.909$ //

- Error en estado estacionario

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

$$e(t) = \lim_{s \to 0} s\frac{1}{s}\left[\frac{1 - RC_S s + 1 - \alpha}{R(C_P + C_S)S + 1}\right]$$

$$e(t) = \lim_{s \to 0} s\frac{1}{s}\left[1 - \frac{1 - 0.25}{1}\right] = \lim_{s \to 0} s\frac{1}{s}\left[1 - 0.75\right] = 0.25$$

$\varepsilon = 0.25\,V$ //