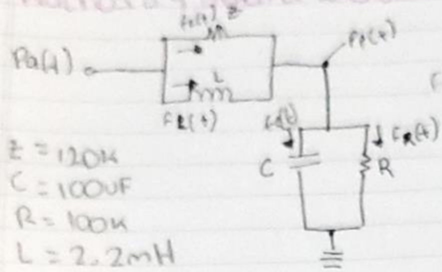
Practica 5 y sistema cardiovascular

10/oct/25



Funcion Principal

$$F_a(t) = F_z(t) + F_L(t) = F_c(t) + F_R(t)$$

$Z = 120K$
$C = 100uF$
$R = 100K$
$L = 2.2mH$

$$F_z(t) = \frac{Pa(t) - Pp(t)}{Z} \qquad F_c(t) = \frac{C\,d\,Pp(t)}{dt}$$

$$F_L(t) = \frac{1}{L}\int [Pa(t) - Pp(t)]\,dt \qquad F_r(t) = \frac{Pp(t)}{R}$$

Procedimiento algebraico

$$\frac{Pa(t)}{Z} - \frac{Pp(t)}{Z} + \frac{1}{L}\int Pa(t) - Pp(t)\,dt = C\frac{d\,Pp(t)}{dt} + \frac{Pp(t)}{R}$$

$$\frac{Pa(s)}{Z} - \frac{Pp(s)}{Z} + \frac{Pa(s) - Pp(s)}{LS} = CS\,Pp(S) + \frac{Pp(S)}{R}$$

$$\left(\frac{1}{Z} + \frac{1}{LS}\right)Pa(s) = \left(CS + \frac{1}{R} + \frac{1}{Z} + \frac{1}{LS}\right)Pp(S)$$

$$\frac{LS + Z}{LZS}\,Pa(s) = \frac{CL^2 + LZS + RLS + RZ}{RLZS}\,Pp(S)$$

$$\frac{Pp(s)}{Pa(S)} = \frac{\frac{LS + Z}{LZS}}{\frac{CLS^2 + (LZ + RL)S + RZ}{RLZS}} = \frac{(LS + Z)(RLZS)}{(LZS)(CLS^2 + (LZ + RL)S + RZ)} =$$

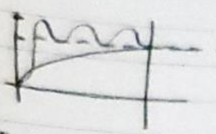
Practica 5.4 sistema cardiovascular

10/Oct/25

• Error en estado estacionario

$$c(S) = \lim_{s \to 0} s\, Pa(S) \left[\frac{1 - Pp(S)}{Pa(S)} \right]$$

$$= \lim_{s \to 0} s \cdot \frac{1}{s} \left[1 - \frac{RLs + Rz}{CLRz s^2 + (Lz + RL)s + Rz} \right] = 1 - Rz/Rz = \emptyset$$



• Estabilidad en lazo abierto

$$z_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \qquad a = CLRz,\ b = Lz + RL,\ c = Rz$$

$$\lambda_{1,2} = \frac{-(Lz + RL) \pm \sqrt{(Lz + RL)^2 - 4((CLRz)(Rz))}}{2} = \frac{(-)()}{+}$$

El sistema tiene una respuesta estable porque $Re\,\lambda_{1,2} < \emptyset$

• Modelo de ecuaciones integro diferenciales de (t)

$$Pp(t)\left(\frac{1}{R} + \frac{1}{z}\right) = \frac{Pa(t)}{z} + \frac{1}{L}\int [Pa(t) - Pp(t)]\, dt - C\frac{d\,Pp(t)}{dt}$$

$$\therefore Pp(t) = \left(\frac{Pa(t)}{z} + \frac{1}{L}\int (Pa(t) - Pp(t))\, dt - C\frac{d\,Pp(t)}{dt} \right) \cdot \frac{zR}{z + R}$$