ENGENHARIA DE CONTROLE E AUTOMAÇÃO
CONTROLE II - 2020.1

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Capítulo 03 - Sinais Amostrados

Cálculo da função de transferência de m(t)/e(t) do amostrador analógico

Capacitor

$v_c(t) := \left(\frac{1}{C}\right)\cdot\int_0^t i(\tau)\,d\tau$ aplicando Laplace: $V_c(s) := \left(\frac{1}{C\cdot s}\right)\cdot I(s)$

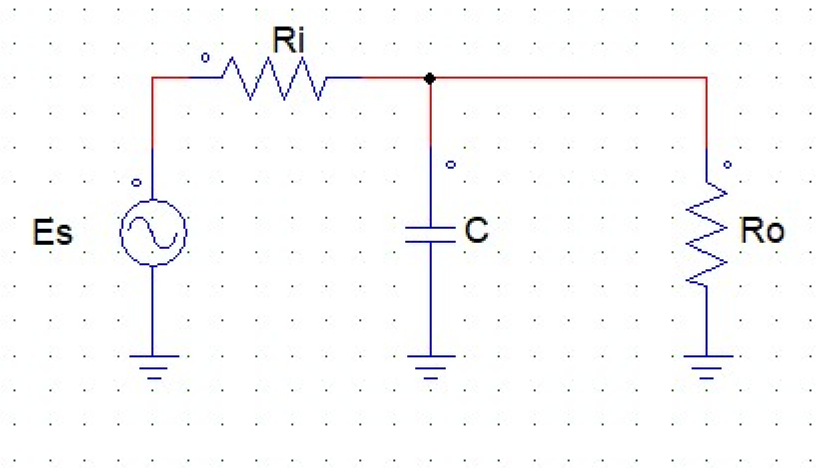
Indutor

$v_L(t) := L\cdot\left(\frac{d}{dt}i(t)\right)$ aplicando Laplace: $V_L(s) := L\cdot s\cdot I(s)$

Resistor

$v_R(t) := R\cdot i(t)$ aplicando Laplcace $V_R(s) := R\cdot I(s)$

Para chave fechada, t = 1



Aplicando LTK para malha 1:

$$-E(s) + R_i\cdot I_1(s) + \left(\frac{1}{C\cdot s}\right)\left(I_1(s) - I_2(s)\right) := 0$$

$$-E(s) + R_i\cdot I_1(s) + \left(\frac{1}{C\cdot s}\right)\cdot I_1(s)\_\left(\frac{1}{C\cdot s}\right)\cdot I_2(s) := 0$$

$$R_i\cdot\left(\frac{1}{C\cdot s}\right)\cdot I_1(s) - \left(\frac{1}{C\cdot s}\right)\cdot I_2(s) := E(s) \qquad eq_1$$

Aplicando LTK para malha 2:

$$\left(\frac{1}{C\cdot s}\right)\cdot\left(I_2(s) - I_1(s)\right) + R_o\cdot I_2(s) := 0$$

$$\left(\frac{-1}{C\cdot s}\right)\cdot I_1(s) + \left(\frac{1}{C\cdot s}\right)\cdot I_2(s) + R_o\cdot I_2(s) := 0$$

$$\left(\frac{-1}{C\cdot s}\right)\cdot I_1(s) + \left(R_o + \frac{1}{C\cdot s}\right)\cdot I_2(s) := 0 \qquad eq_2$$

$$\Delta := \begin{pmatrix} R_i + \frac{1}{C\cdot s} & \frac{-1}{C\cdot s} \\ \frac{-1}{C\cdot s} & R_o + \frac{1}{C\cdot s} \end{pmatrix} \qquad := \begin{pmatrix} E(s) \\ 0 \end{pmatrix} \qquad \Delta_1 := \begin{pmatrix} E(s) & \frac{-1}{C\cdot s} \\ 0 & R_o + \frac{1}{C\cdot s} \end{pmatrix} \qquad I_1(s) := \frac{\Delta_1}{\Delta} \qquad I_1(s) := \frac{E(s)\cdot\left(R_o + \frac{1}{C\cdot s}\right)}{\left(R_i\cdot R_o\right) + \left(\frac{1}{C\cdot s}\right)\cdot\left(R_i + R_o\right)}$$

$$\Delta_2 := \begin{pmatrix} R_i + \frac{1}{C \cdot s} & E(s) \\ \frac{-1}{C \cdot s} & 0 \end{pmatrix}$$

$$I_2(s) := \frac{\Delta_2}{\Delta}$$

$$I_2(s) := \frac{\frac{E(s)}{C \cdot s}}{(R_i \cdot R_o) + \left(\frac{1}{C \cdot s}\right) \cdot (R_i + R_o)}$$

$$M(s) := R_o \cdot I_2(s)$$

$$M(s) := R_o \cdot \left[\frac{\frac{E(s)}{C \cdot s}}{(R_i \cdot R_o) + \left(\frac{1}{C \cdot s}\right) \cdot (R_i + R_o)}\right]$$

$$\frac{M(s)}{\frac{E(s)}{C \cdot s}} := \left[\frac{R_o}{(R_i \cdot R_o) + \left(\frac{1}{C \cdot s}\right) \cdot (R_i + R_o)}\right]$$

$$M(s) \cdot \frac{C \cdot s}{E(s)} := \left[\frac{R_o}{(R_i \cdot R_o) + \left(\frac{1}{C \cdot s}\right) \cdot (R_i + R_o)}\right]$$

$$\frac{M(s)}{E(s)} := \left(\frac{1}{C \cdot s}\right) \cdot \left[\frac{R_o}{(R_i \cdot R_o) + \left(\frac{1}{C \cdot s}\right) \cdot (R_i + R_o)}\right]$$

$$\frac{M(s)}{E(s)} := \left(\frac{R_o}{R_o \cdot R_i \cdot C \cdot s + R_i + R_o}\right)$$

$$G(s) := \frac{M(s)}{E(s)}$$