2° Tarea análisis de sistemas lineales

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Se utilizo octave para generar la grafica de la función con entrada Step (rampa)

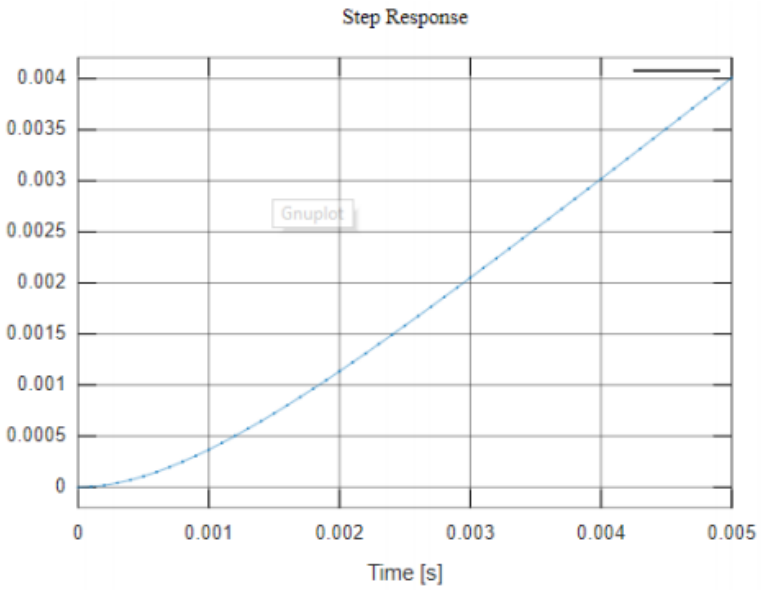
$$F(s) = \frac{1}{\mathrm{s} + \mathrm{C1} + \mathrm{R1} + 1}$$

$$\lim_{s \to 0} \; S * F(S) * E(S)$$

$$\lim_{s \to 0} \; S * \frac{1}{S * C_1 * R_1 + 1} * \frac{1}{S^2}$$

$$\lim_{S \to 0} \quad \frac{1}{S(S * C_1 * R_1 + 1)} =$$

```
octave:5> num=[1]
num =  1
octave:6> den=[0.001,1]
den =

   0.0010000   1.0000000

octave:7> fun_trans=tf(num,den)

Transfer function 'fun_trans' from input 'u1' to output ...

          1
 y1:  -----------
      0.001 s + 1

Continuous-time model.
octave:8> s=tf('s')

Transfer function 's' from input 'u1' to output ...

 y1:  s

Continuous-time model.
```



Valor de (V_t)

$$\frac{V_t}{V_{in}} = \frac{1}{S * C_1 * R_1 + 1}$$

$$V_t = \frac{1}{S * C_1 * R_1 + 1} * V_{in}$$

$$V_t = \frac{1}{S * C_1 * R_1 + 1} * \frac{1}{S^2}$$

$$V_t = \frac{1}{S^2(S * C_1 * R_1 + 1)}$$

Con fracciones parciales se obtiene:

$$\frac{1}{S^2(S*C_1*R_1+1)} = \frac{A*S+B}{S^2} + \frac{C}{S*C_1*R_1+1}$$

Calculando A,B,C con Octave

```
octave:3> num=[1]
num =  1
octave:4> den=[0.001,1,0,0]
den =

   0.00100   1.00000   0.00000   0.00000

octave:5> [r,p,k,e]=residue(num,den)
r =

  -0.0010000
   1.0000000
   0.0010000

p =

       0
       0
   -1000
```

A=-0.001= $-C_1 * R_1$

B=1

C=0.001=$C_1 * R_1$

$$\frac{1}{S^2(S*C_1*R_1+1)} = \frac{-C_1*R_1*S+1}{S^2} + \frac{C_1*R_1}{S*C_1*R_1+1}$$

$$= \frac{-C_1 * R_1}{S} + \frac{1}{S^2} + \frac{1}{S + \frac{1}{C_1 * R_1}}$$

Aplicando la transformada de Laplace obtenemos la ecuación de V_t

$$V_t = t^{-C_1 * R_1} + t + e^{-\frac{1}{C_1 * R_1} * t}$$

$$= \frac{-C_1 * R_1 * S + 1}{S^2} + \frac{C_1 * R_1}{S * C_1 * R_1 + 1}$$

$$= \frac{-C_1 * R_1 * S}{S^2} + \frac{1}{S^2} + \frac{C_1 * R_1}{S * C_1 * R_1 + 1}$$

$$= \frac{-C_1 * R_1}{S} + \frac{1}{S^2} + \frac{C_1 * R_1}{C_1 * R_1 \left(S + \frac{1}{C_1 * R_1}\right)}$$