



Control Automático
EM-720

Tarea #2

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Segundo Cuatrimestre 2018

Primero se presenta la función desarrollada a mano.

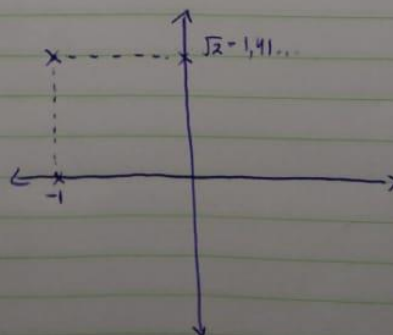
$$\begin{aligned}
 G_0 &= \frac{3}{s^2 + 2s + 1} \\
 &= \frac{3}{\frac{s^2 + 2s + 1}{1 + 3}} \\
 &= \frac{3}{\frac{s^2 + 2s + 1}{s^2 + 2s + 1 + 3}} \\
 &= \frac{3(s^2 + 2s + 1)}{(s^2 + 2s + 1)(s^2 + 2s + 4)} \\
 &= \frac{3}{s^2 + 2s + 4} \quad \Longleftrightarrow \quad \frac{W_n^2}{s^2 + 2\frac{1}{W_n}s + W_n^2} \\
 &\quad \Longleftrightarrow = \frac{3}{4} \cdot \frac{4}{s^2 + 2s + 4}
 \end{aligned}$$

$$\begin{aligned}
 W_n^2 &= 3 \\
 W_n &= \sqrt{3}
 \end{aligned}$$

$$\begin{aligned}
 \alpha &= -\frac{1}{W_n} \\
 \alpha &= -(\sqrt{3}/3)(\sqrt{3}) \\
 \alpha &= -1
 \end{aligned}$$

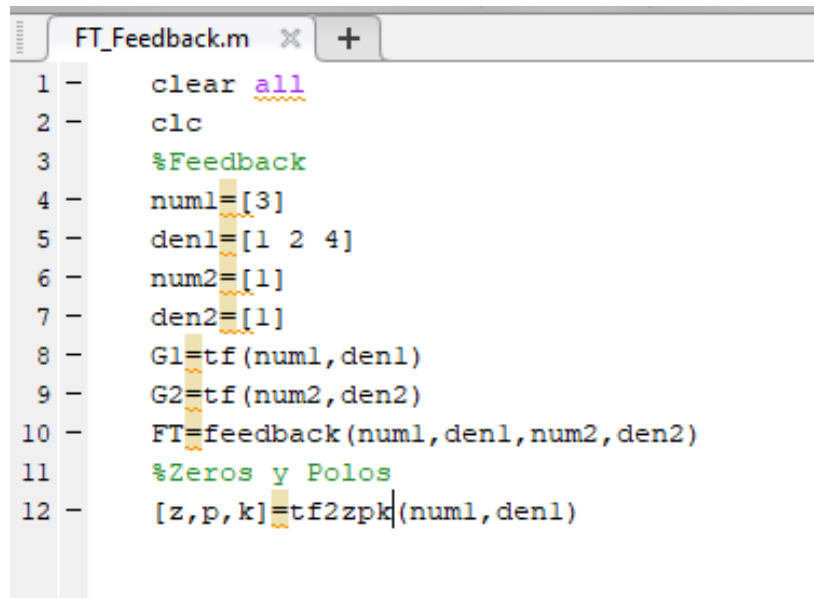
$$\begin{aligned}
 w &= W_n \sqrt{1 - \frac{1}{W_n^2}} \\
 w &= (\sqrt{3}) \sqrt{1 - (\sqrt{3}/3)^2} \\
 w &= \sqrt{2} \rightarrow 1,41, \dots
 \end{aligned}$$

$$\begin{aligned}
 2\frac{1}{W_n} W_n &= 2 \\
 \frac{1}{W_n} W_n &= 1 \\
 \frac{1}{W_n} &= 1/W_n \\
 \frac{1}{W_n} &= \sqrt{3}/3
 \end{aligned}$$



Luego desarrollada a través de **MATLAB**

- Primero se muestra en el SCRIPT los comandos a realizar.



```
1 - clear all
2 - clc
3 - %Feedback
4 - num1=[3]
5 - den1=[1 2 4]
6 - num2=[1]
7 - den2=[1]
8 - G1=tf(num1,den1)
9 - G2=tf(num2,den2)
10 - FT=feedback(num1,den1,num2,den2)
11 - %Zeros y Polos
12 - [z,p,k]=tf2zpk(num1,den1)
```

- Después se ejecutan.



```
Command Window

num1 =

     3

den1 =

     1     2     4

num2 =

     1

den2 =

     1

G1 =

     3
-----
s^2 + 2 s + 4

fx Continuous-time transfer function.
```

```
Command Window

G2 =

    1

Static gain.

FT =

    0    0    3

z =

    0
    0

p =

    -1.0000 + 1.7321i
    -1.0000 - 1.7321i

k =

    3
```

f_k