

Tarea Número 2.

Control Automático EM 720

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Sistemas de segundo orden:

$$G_0 = \frac{3}{s^2 + 2s + 1} \quad \text{Ecuación (1)}$$

$$G_R = \frac{G_0}{1 + G_0} \quad \text{Ecuación (2)}$$

Sustituyendo ecuación (1) en (2):

$$G_R = \frac{\frac{3}{s^2 + 2s + 1}}{1 + \frac{3}{s^2 + 2s + 1}} = \frac{\frac{3}{s^2 + 2s + 1}}{\frac{s^2 + 2s + 1 + 3}{s^2 + 2s + 1}} = \frac{3}{s^2 + 2s + 4} = \frac{3}{4} * \frac{4}{s^2 + 2s + 4}$$

De esta forma se tiene:

$$G_R = \frac{3}{4} * \frac{4}{s^2 + 2s + 4} = \frac{\omega_n^2}{s^2 + 2\zeta\omega_n s + \omega_n^2} \quad \text{Ecuación (3)}$$

Por lo tanto:

$$\omega_n^2 = 4 \rightarrow \omega_n = 2 \quad \text{Ecuación (4)}$$

$$2\zeta\omega_n = 2 \rightarrow \zeta = \frac{1}{2} \quad \text{Ecuación (5)}$$

De esta forma:

$$\alpha = \zeta\omega_n = \frac{1}{2} * 2 = 1$$

$$\omega = \omega_n \sqrt{1 - \zeta^2} = 2 \sqrt{1 - \left(\frac{1}{2}\right)^2} = \sqrt{3} \quad \text{Ecuación (6)}$$

$$S = -1 \pm \sqrt{3}i \text{ Ecuación (7)}$$

## II Parte: Programación en Octave.

The screenshot shows the Octave environment with the following workspace variables:

Name	Class	Dimension	Value
Do	tf	1x1	...
Go	tf	1x1	...
Ho	tf	1x1	...
ans	double	2x1	[-1.0000 + 1.7321i; -1.0000 - 1.7321i]
den	double	1x3	[1, 2, 1]
num	double	1x1	1
sys	tf	1x1	...

The Command Window shows the following execution steps:

```

>> zeros = ...
>> %Tarea 2: Daniel Rivera
>> Go=tf([3],[1 2 1])
Transfer function 'Go' from input 'u1' to output ...
y1: -----
      3
      s^2 + 2 s + 1
Continuous-time model.
>> Ho=tf([1],[1])
Transfer function 'Ho' from input 'u1' to output ...
y1: 1
Continuous-time model.
>> Do=feedback(Go,Ho)
Transfer function 'Do' from input 'u1' to output ...
y1: -----
      3
      s^2 + 2 s + 4
Continuous-time model.
>> pole(Do)
ans =
-1.0000 + 1.7321i
-1.0000 - 1.7321i
  
```