RESPUESTA TEMPORAL EN EL PLANO COMPLEJO

Tarea #4

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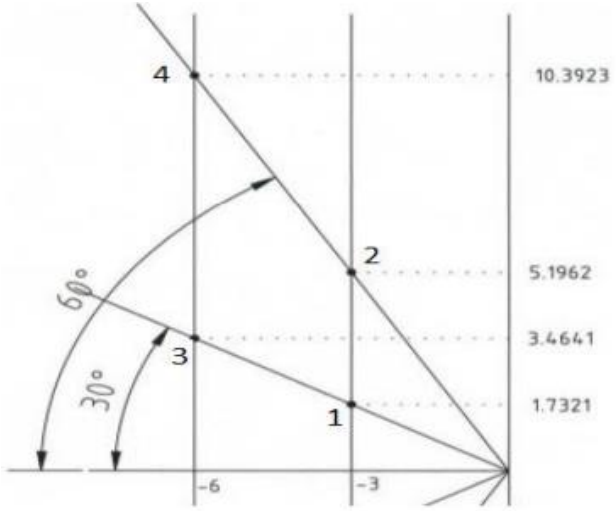
Del siguiente sistema encuentre:

1. Coeficiente de amortiguamiento y frecuencia natural para cada punto.

2. Mp para cada punto.

3. Proponer un sistema con retroalimentación negativa para cada punto.



Respuestas:

1. Obtener ζ con la siguiente formula ζ = cos (θ)

Para θ = 30°

ζ = cos(θ)→ ζ = cos (30) → ζ = √3/ 2

Para θ = 60°

ζ = cos(θ)→ ζ = cos (60) → ζ = ½

2. Obtener Wn con la siguiente formula Wn = α/ζ

Para α = 3, ζ =√3 /2

Wn =α/ζ → Wn = 3 / $\frac{\sqrt{3}}{2}$ → Wn = 2√3

Para α = 3, ζ =$\frac{1}{2}$

Wn = $\frac{\alpha}{\zeta}$ →Wn =3/ $\frac{1}{2}$ → Wn = 6

Para α = 6, ζ =√3/2

Wn = $\frac{\alpha}{\zeta}$→ Wn = 6 $\frac{\sqrt{3}}{2}$→ Wn = 4√3

Para α = 6, ζ = $\frac{1}{2}$

Wn = $\frac{\alpha}{\zeta}$ →Wn =6/ $\frac{1}{2}$→ Wn = 12

2-) Obtener Mp con la siguiente formula $Mp= e^{-(\frac{\zeta\pi}{\sqrt{1-\zeta^2}})}$

Para ζ =$\frac{\sqrt{3}}{2}$

$$Mp = e^{-\left(\frac{\zeta\cdot\pi}{\sqrt{1-\zeta^2}}\right)} \rightarrow Mp = e^{-\left(\frac{\frac{\sqrt{3}}{2}\cdot\pi}{\sqrt{1-\frac{\sqrt{3}}{2}^2}}\right)} \rightarrow Mp = 4{,}33x10^{-3}$$

Para ζ = $\frac{1}{2}$

$$Mp = e^{-\left(\frac{\zeta\cdot\pi}{\sqrt{1-\zeta^2}}\right)} \rightarrow Mp = e^{-\left(\frac{\frac{1}{2}\cdot\pi}{\sqrt{1-\frac{1}{2}^2}}\right)} \rightarrow Mp = 0{,}16$$

3-) Obtener $Ts2\%$ con la siguiente formula $Ts2\% = \frac{4}{\zeta * Wn}$

Para $\zeta = \frac{\sqrt{3}}{2}$, Wn = 2√3

$$T_{s_{2\%}} = \frac{4}{\zeta * Wn} \rightarrow T_{s_{2\%}} = \frac{4}{\frac{\sqrt{3}}{2} * 2\sqrt{3}} \rightarrow T_{s_{2\%}} = \frac{4}{3}$$

Para $\zeta = \frac{\sqrt{3}}{2}$, Wn = 4√3

$$T_{s_{2\%}} = \frac{4}{\zeta * Wn} \rightarrow T_{s_{2\%}} = \frac{4}{\frac{\sqrt{3}}{2} * 4\sqrt{3}} \rightarrow T_{s_{2\%}} = \frac{2}{3}$$

Para $\zeta = \frac{1}{2}$, Wn = 6

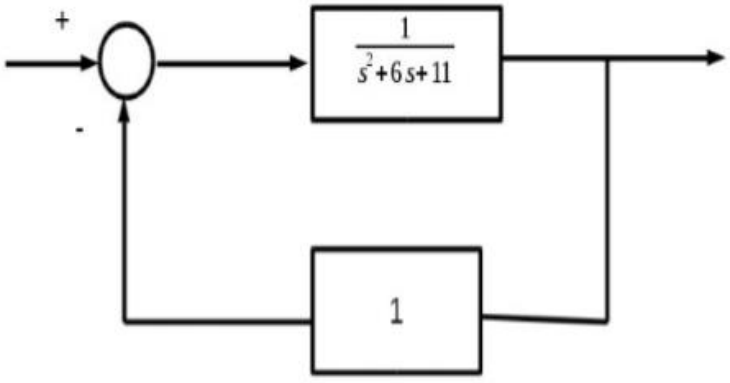
$$T_{s_{2\%}} = \frac{4}{\zeta * Wn} \rightarrow T_{s_{2\%}} = \frac{4}{\frac{1}{2} * 6} \rightarrow T_{s_{2\%}} = \frac{4}{3}$$

Para $\zeta = \frac{1}{2}$, Wn = 12

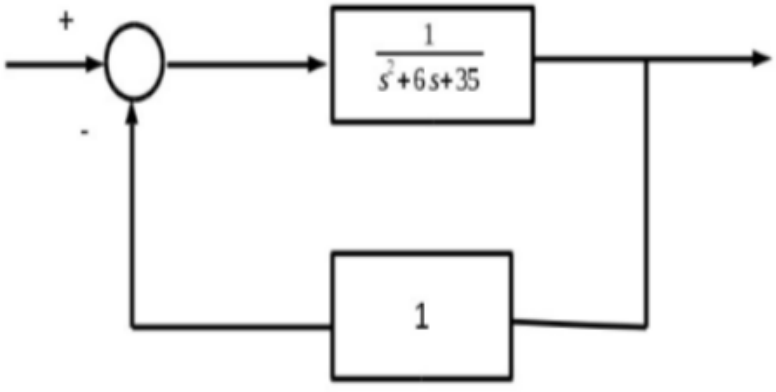
$$T_{s_{2\%}} = \frac{4}{\zeta * Wn} \rightarrow T_{s_{2\%}} = \frac{4}{\frac{1}{2} * 12} \rightarrow T_{s_{2\%}} = \frac{2}{3}$$

4-) Función de transferencia y sistema de bloques

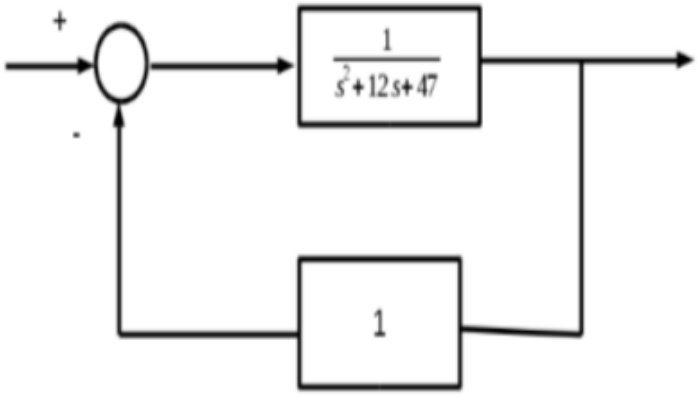
$$\frac{\omega_n^2}{s^2+2\zeta\omega_n s+\omega_n^2} = \frac{1}{12}\cdot\left(\frac{12}{s^2+6s+12}\right)$$



$$\frac{\omega_n^2}{s^2+2\zeta\omega_n s+\omega_n^2} = \frac{1}{36}\cdot\left(\frac{36}{s^2+6s+36}\right)$$



$$\frac{\omega_n^2}{s^2+2\zeta\omega_n s+\omega_n^2} = \frac{1}{48}\cdot\left(\frac{48}{s^2+12s+48}\right)$$



$$\frac{\omega_n^2}{s^2+2\zeta\omega_n s+\omega_n^2} = \frac{1}{144}\cdot\left(\frac{144}{s^2+12s+144}\right)$$