

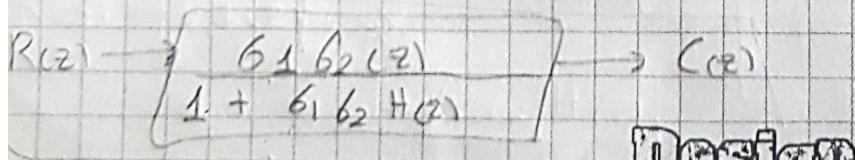
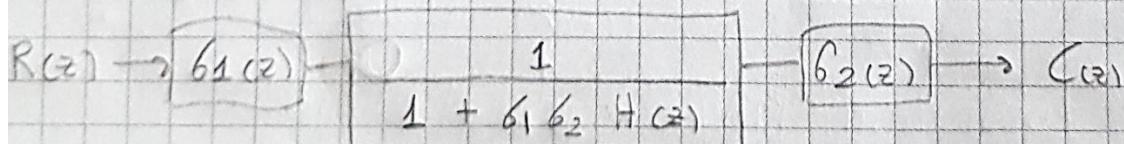
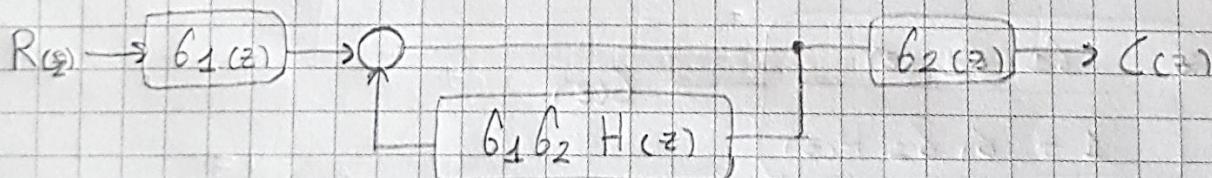
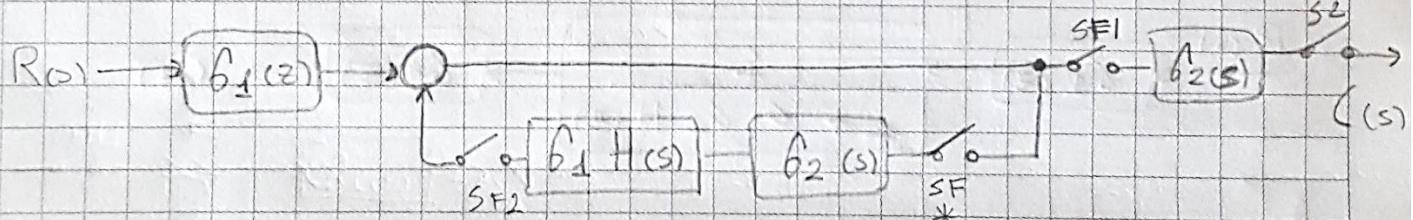
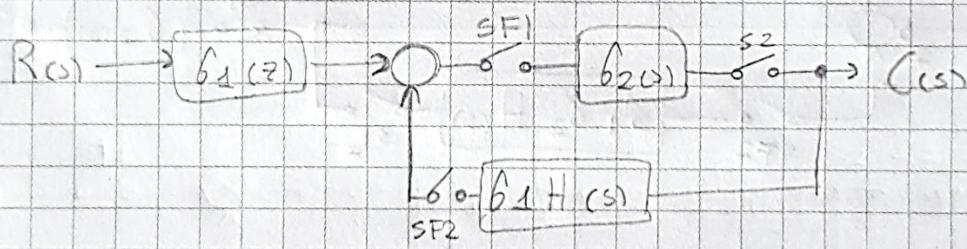
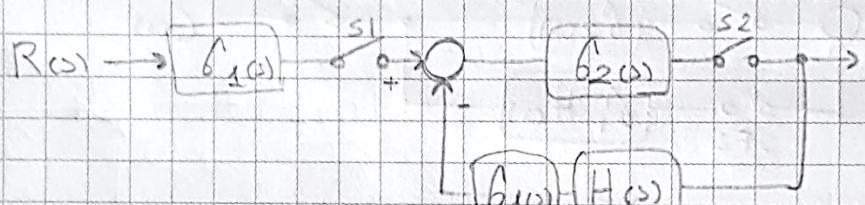
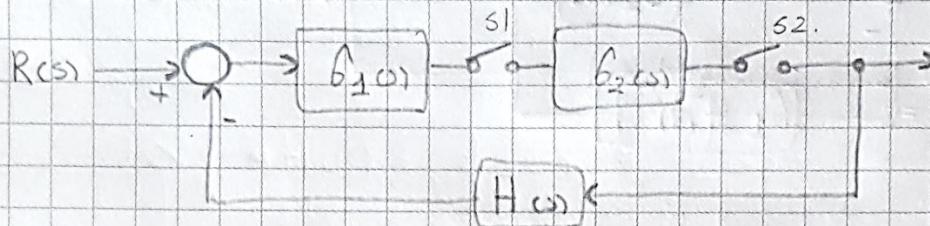
3.9 Determinar.

a) La Función de Transferencia de pulso o la relación entre la entrada y la salida para cada uno de los sistemas que se muestran

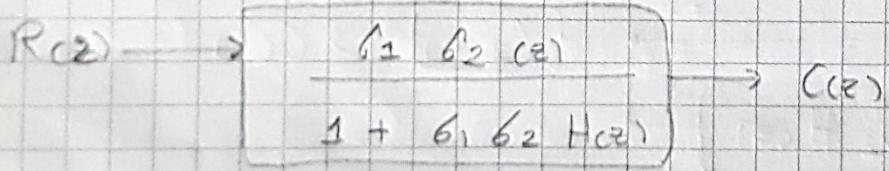
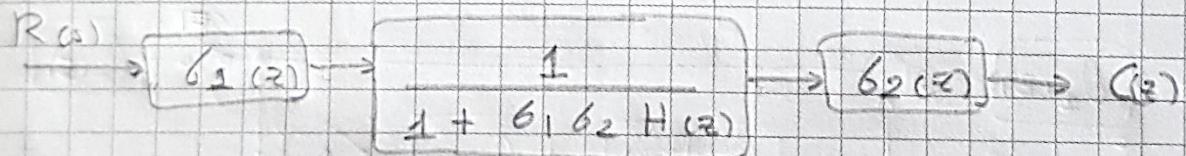
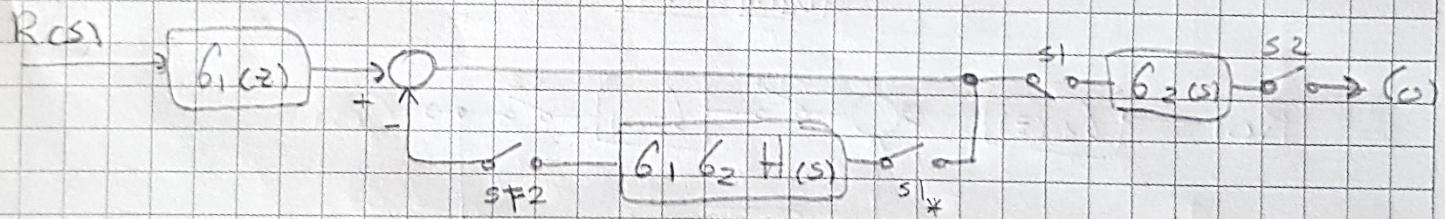
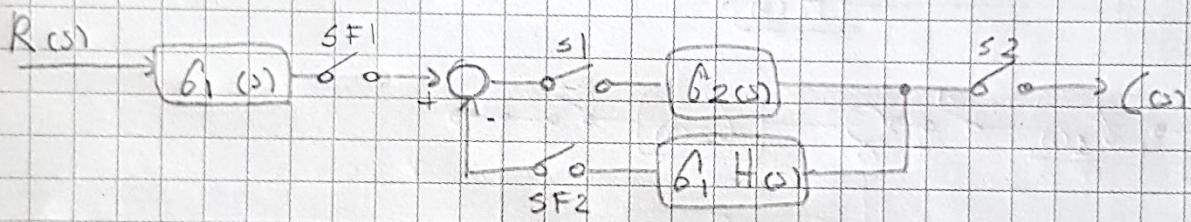
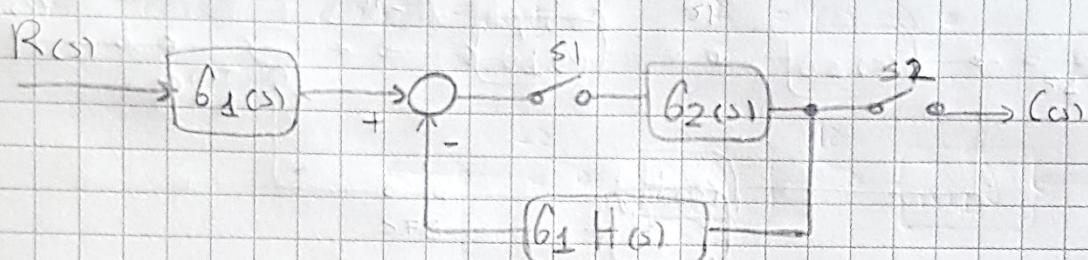
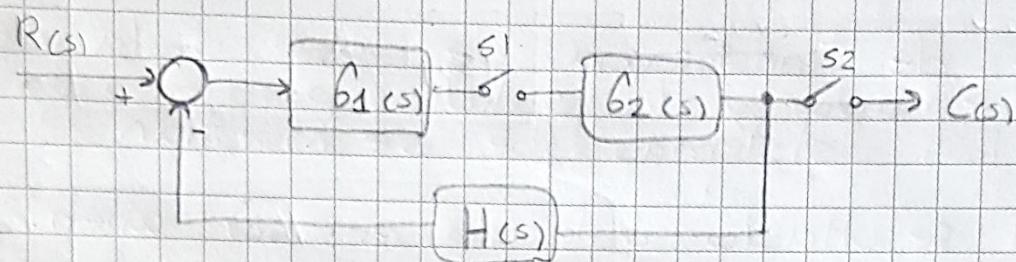
b) Aplicar el resultado obtenido en a) when:

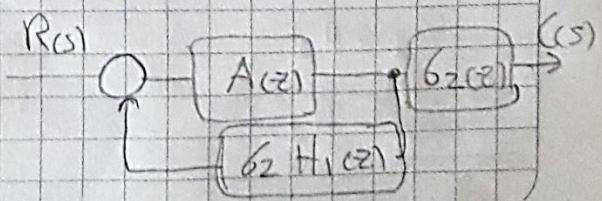
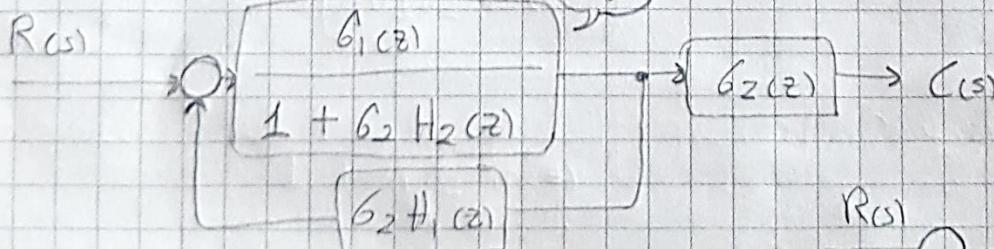
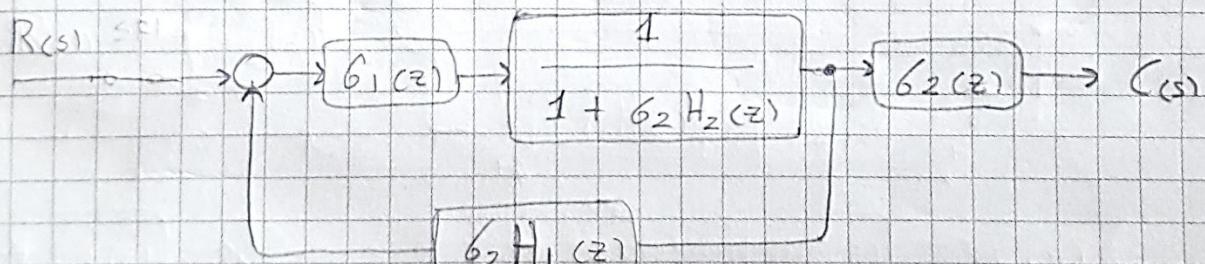
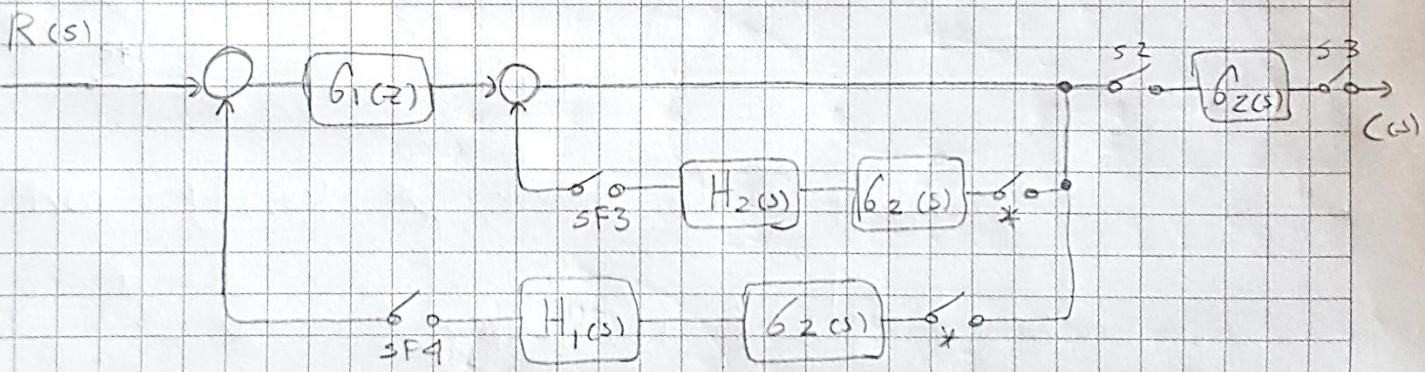
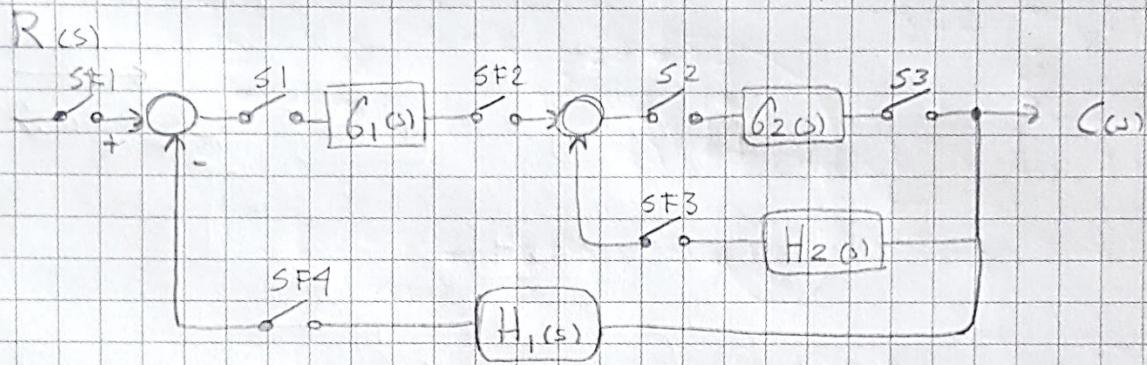
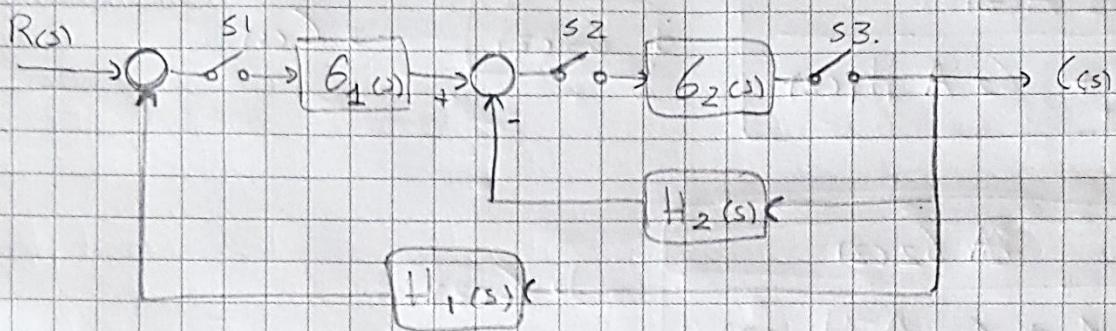
$$\bullet G_1(s) = \frac{0.5}{5s+1} \quad \bullet G_2(s) = \frac{1}{s} \quad \bullet H(s) = H_1(s) = H_2(s) = 1$$

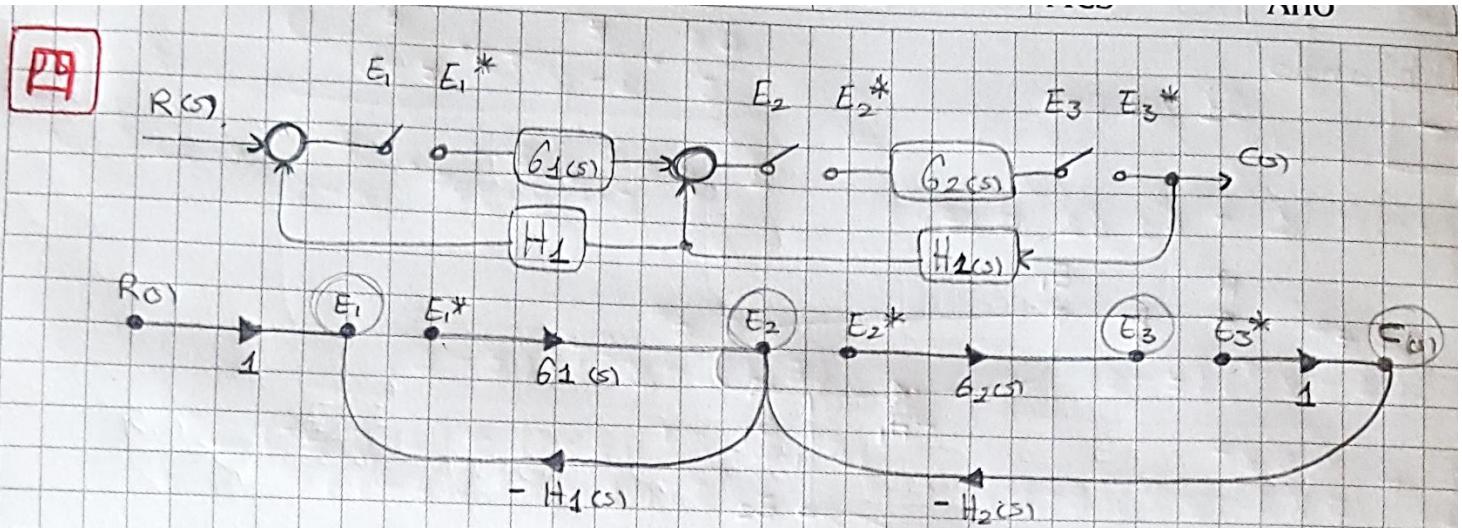
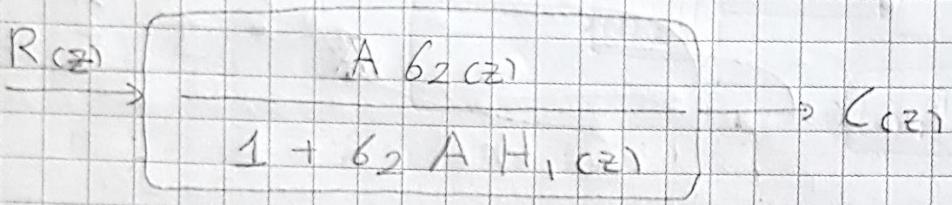
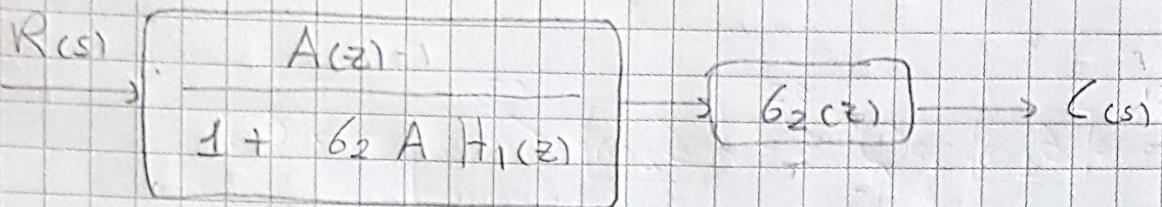
-



Resumen







- Primero señales.

$$E_1 = 1 \cdot R(s) - H_1(s) E_1^* \quad G_1(s) \quad E_1^*$$

$$E_2 = G_1(s) E_1^* - H_2(s) C(s) \quad 1 \quad E_2^*$$

$$E_3 = G_2(s) E_2^*$$

$$C(s) = 1 \quad E_3^*$$

- Anular señales

$$E_1 = R(s) - H_1 G_1 E_1^*(s)$$

$$E_2 = G_1 E_1^*(s) - H_2 E_3^*(s)$$

$$E_3 = G_2(s) E_2^*$$

$$C(s) = E_3^*$$

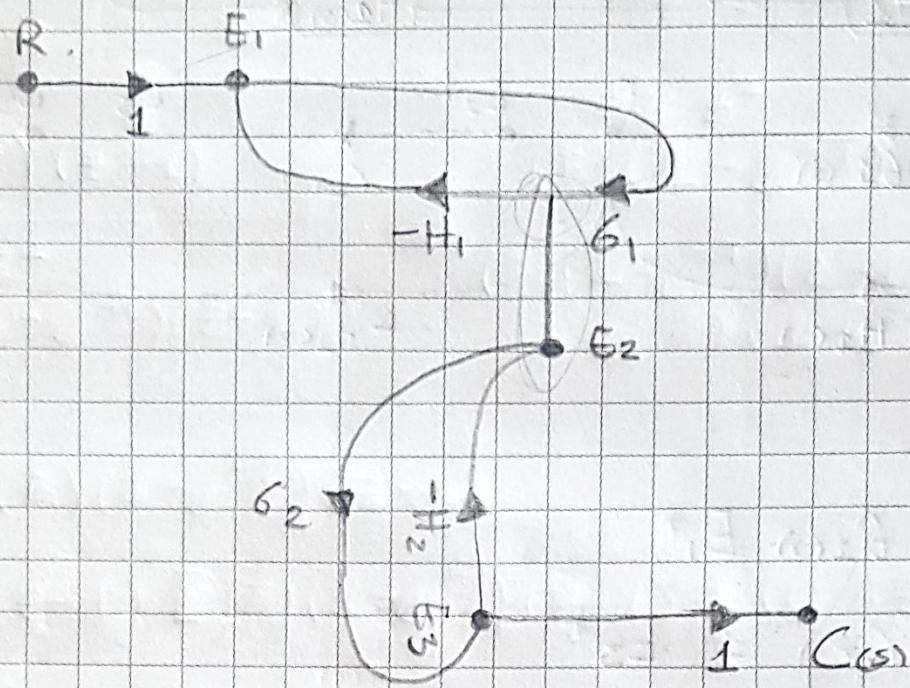
- Poner Asterisk

$$E_1^* = R_{(s)}^* - H_1^* G_1^* E_{1(s)}^*$$

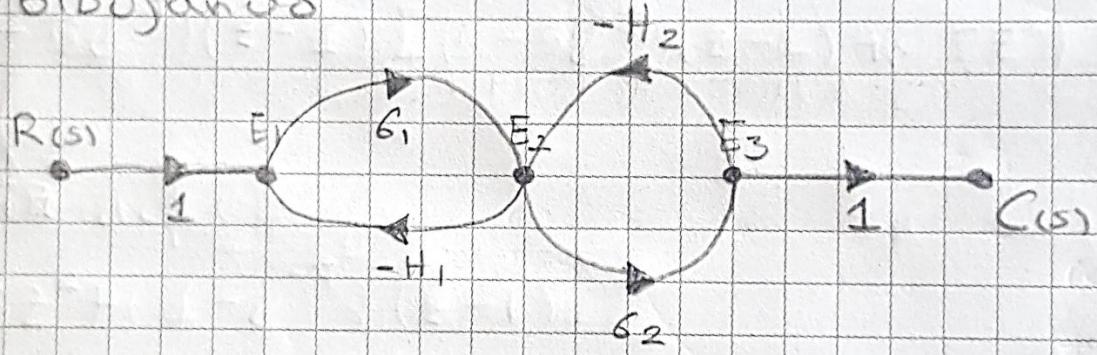
$$E_2 = G_1^*(s) E_{1(s)}^* - H_2^* E_{3(s)}^*$$

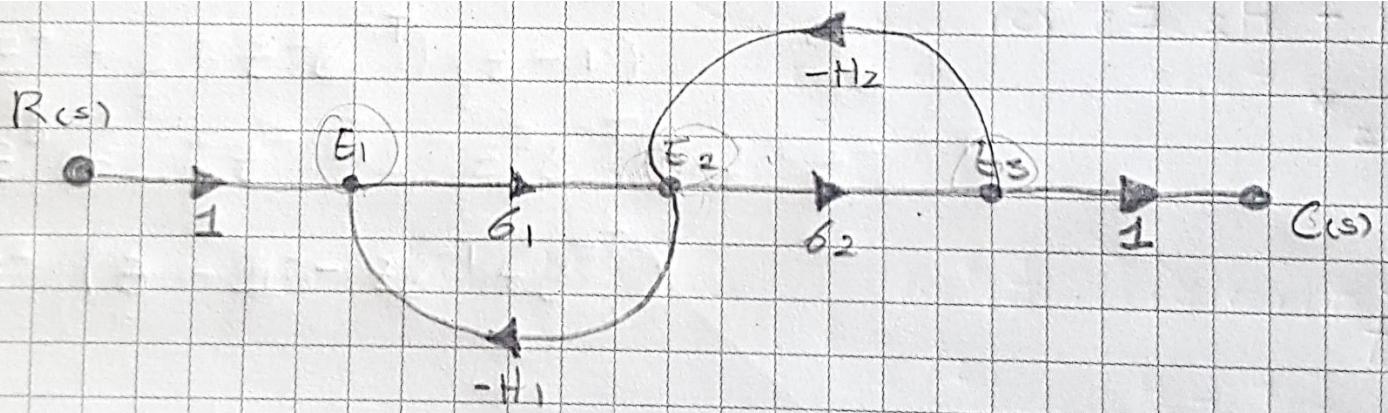
$$E_3 = G_2^*(s) E_2^*$$

$$C(s) = E_3^*$$



Redibujando





1. Ganancia de Trajectoria directa.

$$G_1 \cdot G_2$$

2. Ganancia de Malla.

$$G_1 \cdot H_1$$

$$G_2 \cdot H_2$$

3. Mallas que no se tocan; dobles.

4 De las que no se tocan si hay tres, mallas triples

5 formar Δ

$$\Delta = 1 - [(G_1 \cdot H_1) + (G_2 \cdot H_2)]$$

$$6. K = 1$$

$$T_1 = G_1 \cdot G_2$$

$$7. \Delta K = 1$$

8. Sustituir en Mason

$$G(s) = T_1 \frac{\Delta}{\Delta}$$

$$G(s) = (G_1 \cdot G_2)(1)$$

$$1 - [G_1 \cdot H_1 + G_2 \cdot H_2]$$

$$G(s) = G_1 G_2$$

$$1 - (G_1 H_1 + G_2 H_2)$$

Reemplazar Valores.

$$\textcircled{1} \quad G_1 = \frac{0,5}{5(z+1)} \quad G_2 = \frac{1}{z} \quad H = 1$$

$$\begin{array}{c} \downarrow \\ \textcircled{6} \end{array} \quad \begin{array}{c} \downarrow \\ \textcircled{2} \end{array} \quad \begin{array}{c} \downarrow \\ \textcircled{1} \end{array}$$

$$\frac{0,5}{5} \cdot \frac{1}{z+1} \quad \left(\frac{z}{z-1} \right) \quad \left(\frac{1}{z-1} \right)$$

$$\downarrow$$

$$\frac{0,5}{5} \cdot \frac{z}{z - e^{-T}}$$

$$\boxed{-} \quad \frac{G_1 G_2 (z)}{1 + G_1 G_2 H (z)} \Rightarrow \frac{\frac{0,5}{5} \cdot \frac{z}{1 - e^{-T}} \cdot \frac{z}{z-1}}{1 + \frac{0,5}{5} \cdot \frac{z}{1 - e^{-T}} \cdot \frac{z}{z-1} \cdot 1}$$

$$\frac{0,5 z^2}{(5)(1 - e^{-T})(z-1)} \Rightarrow \frac{0,5 z^2}{(5)(1 - e^{-T})(z-1)}$$

$$\frac{\frac{1}{1} + \frac{0,5 z^2}{(5)(1 - e^{-T})(z-1)}}{(5)(1 - e^{-T})(z-1) + (0,5 z^2)} =$$

$$\frac{(0,5 z^2)(5)(1 - e^{-T})(z-1)}{(5)(1 - e^{-T})(z-1)}$$

$$(5)(1 - e^{-T})(z-1) \boxed{(5)(1 - e^{-T})(z-1) + (0,5 z^2)}$$

$$\Rightarrow 6_1 H_2(z)$$

$$1 + 6_1 H_2(z)$$

* Es exactamente igual al \ominus , por tanto mismo resultado *

$$0,5 z^2$$

$$(5)(1 - e^{-T})(z-1) + (0,5 z^2)$$

$$\Rightarrow A H_2(z)$$

$$1 + 6_2 A H_1(z)$$

$$A = 6_1(z)$$

$$1 + 6_2 H_2(z)$$

entonces.

$$\frac{6_1(z)}{1 + 6_2 H_2(z)} \cdot 6_2(z)$$

$$\Rightarrow \frac{6_1 6_2(z)}{1 + 6_2 H_2(z)}$$

$$1 + 6_2 \cdot \frac{6_1(z)}{1 + 6_2 H_2(z)} \cdot H_1(z)$$

$$\frac{1}{1} + \frac{6_2 6_1 H_1(z)}{1 + 6_2 H_2(z)}$$

$$\frac{6_1 6_2(z)}{1 + 6_2 H_2(z)}$$

$$\Rightarrow \frac{6_1 6_2(z)}{1 + 6_2 H_2(z) + 6_2 6_1 H_1(z)}$$

$$\frac{1 + 6_2 H_2(z) + 6_2 6_1 H_1(z)}{1 + 6_2 H_2(z)}$$

$$\frac{0,5}{5} \cdot \frac{z}{z - e^{-T}} \cdot \frac{z}{z-1}$$

$$\frac{0,5}{5} = \frac{\frac{1}{2}}{\frac{5}{1}} = \frac{1}{10}$$

$$\frac{1}{1} + \frac{z}{z-1} + \frac{z}{z-1} \cdot \frac{0,5}{5} \cdot \frac{z}{z - e^{-T}}$$

$$\frac{z^2}{(10)(z - e^{-T})(z-1)}$$

$$\frac{1}{1} + \frac{z}{z-1} + \frac{z^2}{(10)(z - e^{-T})(z-1)}$$

$$\frac{z^2}{(10)(z - e^{-T})(z-1)}$$

$$\frac{1}{1} + \frac{(z)(10)(z - e^{-T})(z-1) + (z^2)(z-1)}{(z-1)(10)(z - e^{-T})(z-1)}$$

$\underline{\underline{z^2}}$

$$(10)(z - C^{-1})(z-1)$$

$$\frac{(z-1)(10)(z - C^{-1})(z-1) + (z)(10)(z - C^{-1})(z-1) + (z^2)(z-1)}{(z-1)(10)(z - C^{-1})(z-1)}$$

 $\underline{\underline{z^2}}$

4

$$\frac{(z-1)(10)(z - C^{-1})(z-1) + (z)(10)(z - C^{-1})(z-1) + (z^2)(z-1)}{(z-1)}$$

 $\underline{\underline{z^2(z-1)}}$

$$(z-1)(10)(z - C^{-1})(z-1) + (z)(10)(z - C^{-1})(z-1) + (z^2)(z-1)$$

 $\underline{\underline{z^3 - z^2}}$

$$(z-1)^2(10)(z - C^{-1}) + (10z)(z-1)(z - C^{-1}) + z^3 - z^2$$

四

61 62

$$1 - (61H_1 + 62H_2)$$

$$\frac{1}{10} \cdot \frac{z}{z - C^{-1}} \cdot \frac{z}{z-1}$$

$$\frac{1}{1} - \left(\frac{1}{10} \cdot \frac{z}{z - C^{-1}} + \frac{z}{z-1} \right)$$

$$\frac{z^2}{(10)(z - C^{-1})(z-1)}$$

$$\frac{1}{1} - \frac{(z-1)(z) + (z)(10)(z - C^{-1})}{(10)(z - C^{-1})(z-1)}$$

$$\frac{z^2}{(10)(z - C^{-1})(z-1)}$$

$$\frac{(10)(z - C^{-1})(z-1) - (z-1)(z) + (z)(10)(z - C^{-1})}{(10)(z - C^{-1})(z-1)}$$

$$(10) \quad (z - c^{-1})(z - 1) - (z - 1)(z) + (z)(10)(z - c^{-1})$$

$$(10z - 10)(z - c^{-1}) - z^2 - z + 10z^2 - 10zc^{-1}$$

$$10z^2 - 10zc^{-1} - 10z + 10c^{-1} - z^2 - z + 10z^2 - 10zc^{-1}$$

$$10z^2 - z^2 + 10z^2 - 10zc^{-1} - 10zc^{-1} - 10z - z + 10c^{-1}$$

$$19z^2 - 20zc^{-1} - 11z + 10c^{-1}.$$