COLECCIÓN DE PROBLEMAS

- *ESTABILIDAD EXTERNA*

1. $G_1(s) = \dfrac{1}{(s^2 + 3s + 2)(s + 1)}$

2. $G_2(s) = \dfrac{(-10s^2 + 3)}{2s^2 + 5 + s}$

3. $G_3(s) = \dfrac{e^{-s}}{s^2 + 1}$

4. $G_4(s) = \dfrac{7s^3 - 2s + 3}{(2s^3 + 14s^2 - 12s + 58)}$

5. $\dddot{z}(t) + a_1 \ddot{z}(t) + a_2 \dot{z}(t) = b_1 u(t) + b_0 \dot{u}(t)$

6. $G_6(s) = \dfrac{(3s + 9)}{(s + 4)(s^2 + 4s + 16)}$

7. $G_7(s) = \dfrac{10s}{s^3 + 2s^2 + 3s}$

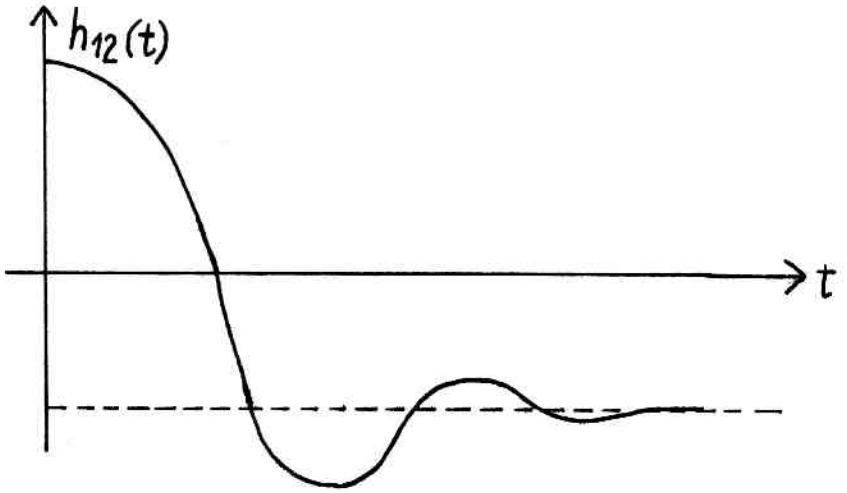
8. $G_8(s) = \dfrac{3e^{-3s}}{-s^3 - s^2 - 8s + 20}$

9. $G_9(s) = \dfrac{1}{(s-5)^2}$

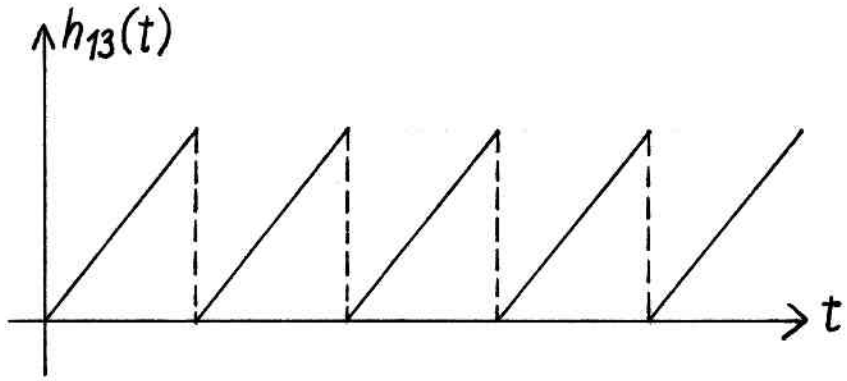
10. $a_0 \dddot{y}(t) + a_1 \ddot{y}(t) + a_3 y(t) = b_1 u(t) + b_0 \dot{u}(t)$

11. $\ddot{y}(t) + 4\dot{y}(t) + 5y(t) = 3u(t)$

12.



13.



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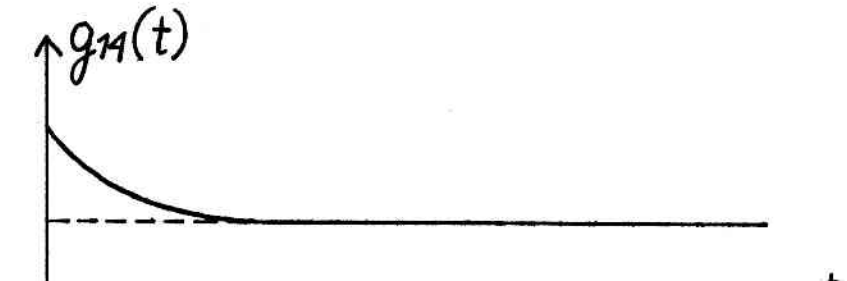

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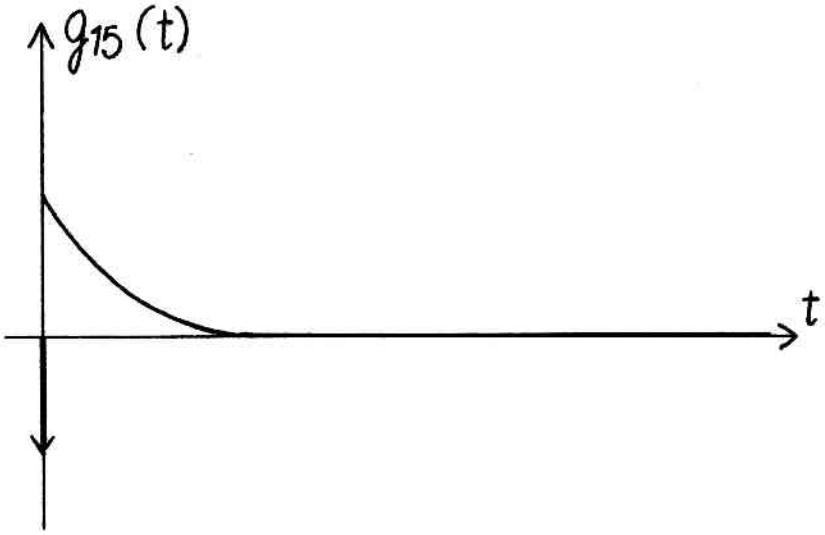
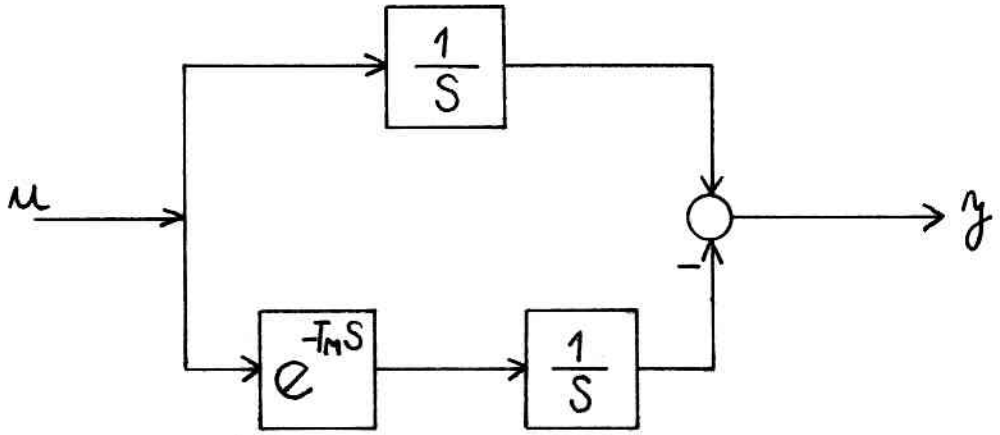


16. Demuestre que el siguiente sistema es estable:



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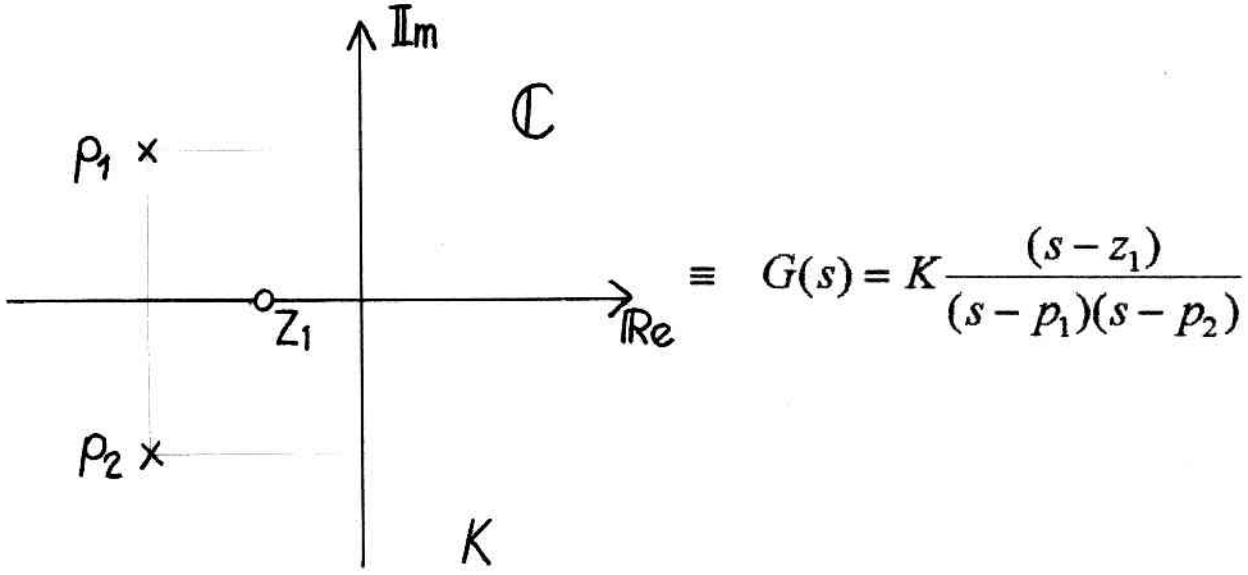
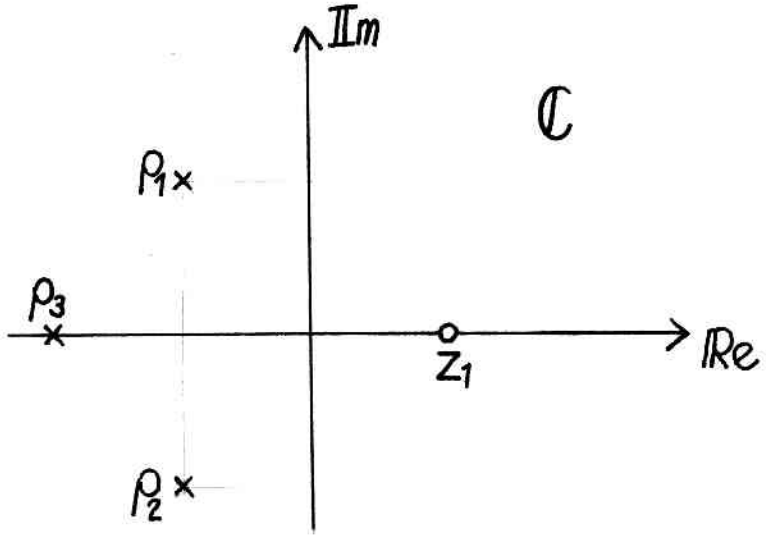
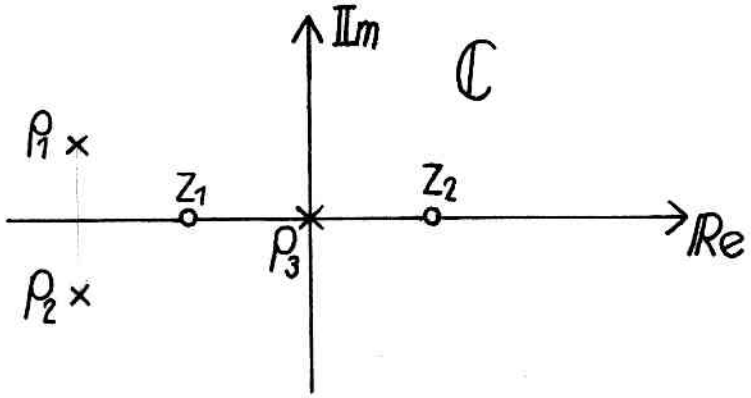


$$\equiv \quad G(s) = K\frac{(s-z_1)}{(s-p_1)(s-p_2)}$$

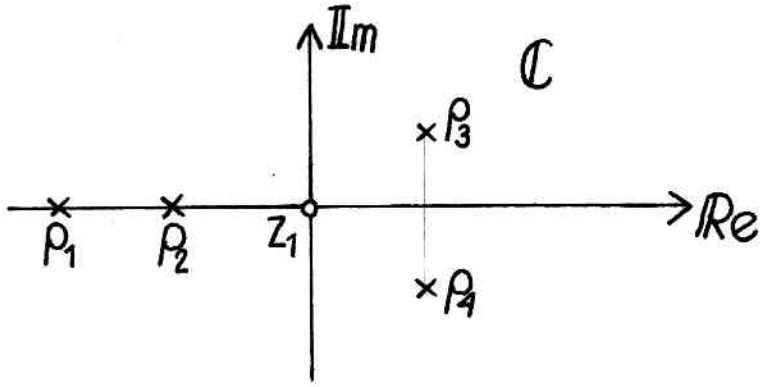
18.


Im
ℂ
p1
p3
z1
Re
p2

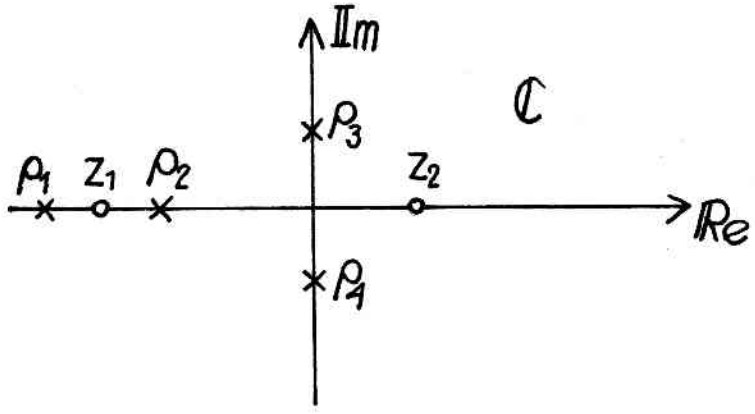
19.


Im
ℂ
p1
z1
z2
p3
Re
p2

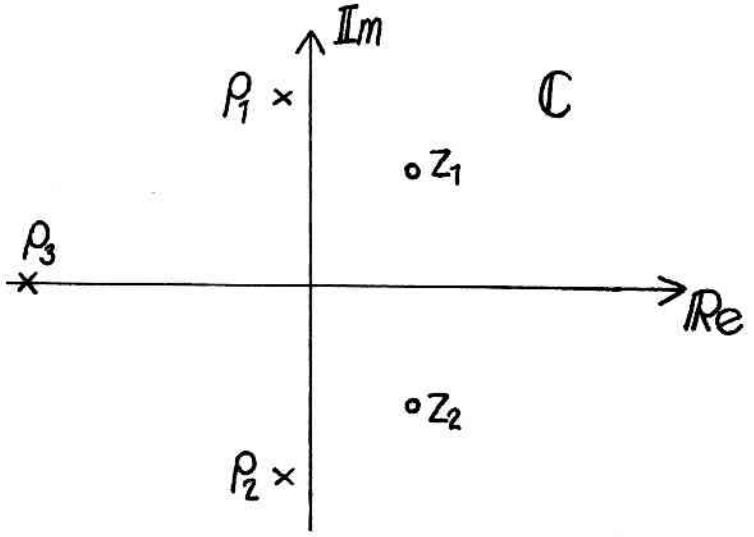
20.


Im
ℂ
p3
p1
p2
z1
Re
p4

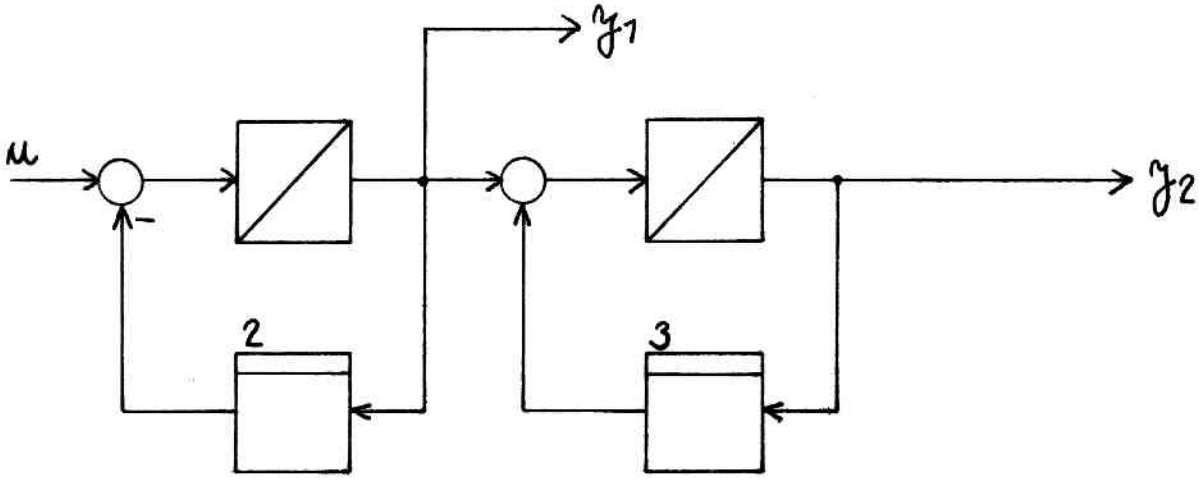
21.


Im
ℂ
p3
p1
z1
p2
z2
Re
p4

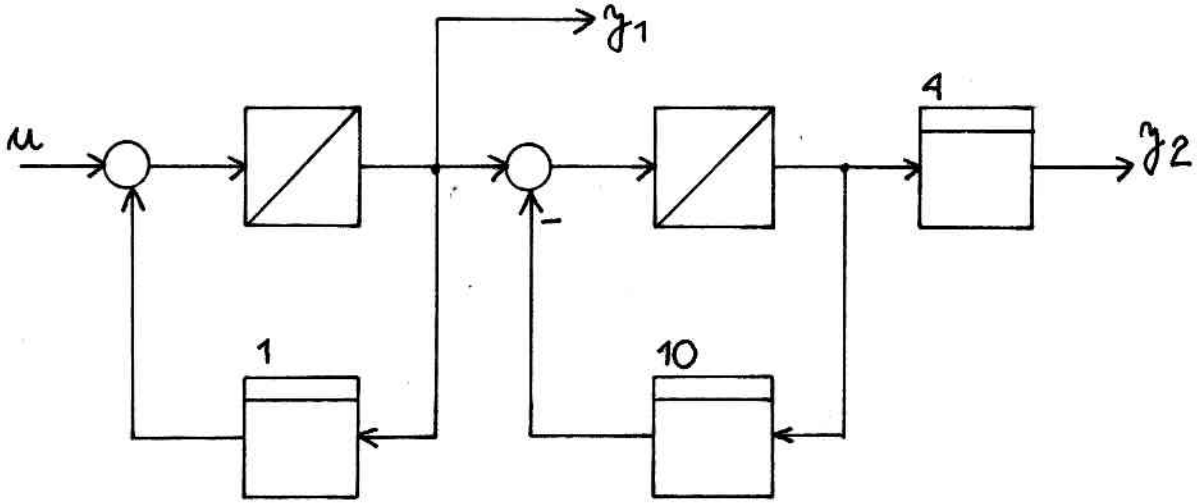
22.



23.



24.



25. $\dot{X} = AX + bu \quad ; \quad y = cX$

$$A = \begin{bmatrix} 8 & 4 \\ -2 & -3 \end{bmatrix} \quad ; \quad b = \begin{bmatrix} 2 \\ 1 \end{bmatrix} \quad ; \quad c^T = \begin{bmatrix} 0 & 1 \end{bmatrix}$$

$$G(s) = \frac{c^T \; adj^T (sI - A)\, b + d \; \pi_A(s)}{\pi_A(s)}$$

$$\pi_A(s) = det(sI - A) = s^2 - 5s - 16$$

$$c^T \; adj^T (sI - A)\, b = s - 12$$

$$G(s) = \frac{s - 12}{s^2 - 5s - 16}$$

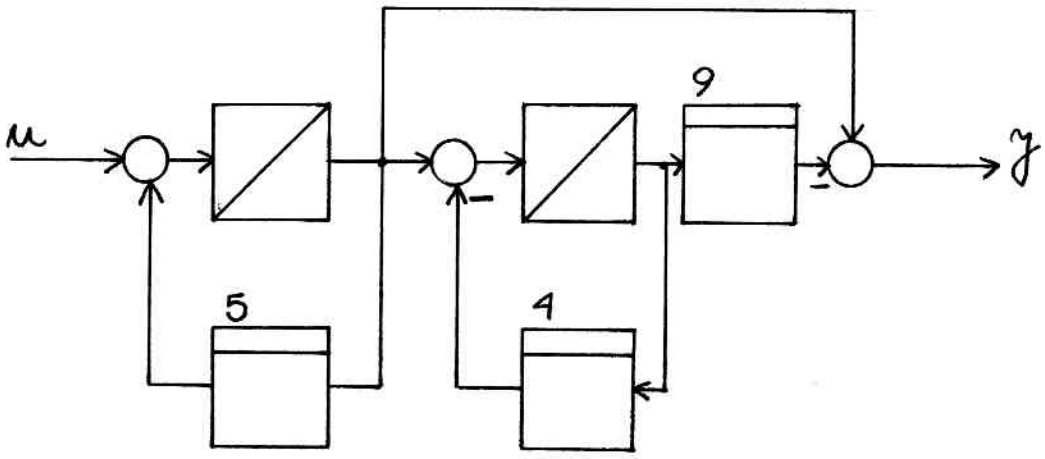
26. $$y(t) = 5 \int_0^t e^{-3(t-\tau)} \; u(\tau)\, d\tau$$

$$y(t) = \int_0^t g(t - \tau)\, u(\tau)\, d\tau$$

27. $y(t) = 2\int_0^t e^{4t}\, u(t-\tau)\, d\tau$

$$y(t) = \int_0^t g(\tau)\, u(t-\tau)\, d\tau$$

28.



i. Inspección → Internamente inestable

ii. Verificar que es externamente estable

(vía DB→FT y EE/ES→FT)

$$G(s) = \frac{1}{s+4}$$