Bonificación para el parcial:

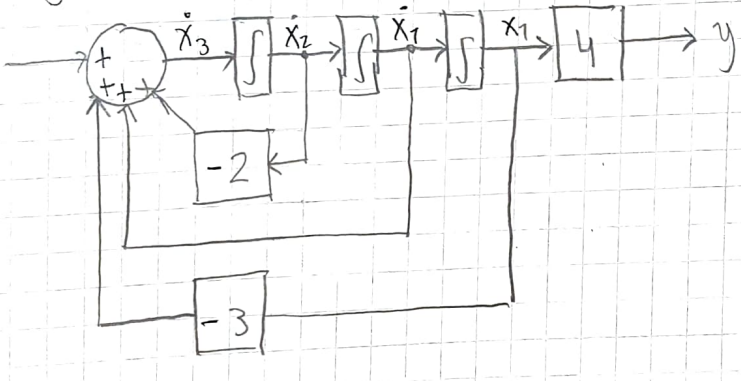
- $G(s) = \frac{4}{s^3+2s^2+s+3} \rightarrow = \frac{1}{s^3+2s^2+s+3} \cdot 4 \hookrightarrow A$

$\therefore \dddot{x} + 2\ddot{x} + \dot{x} + 3 \rightarrow q_1 = x \; ; \; q_2 = \dot{q}_1 = \dot{x} \; ; \; q_3 = \dot{q}_2 = \ddot{x} \; ; \; \dot{q}_3 = \dddot{x}$

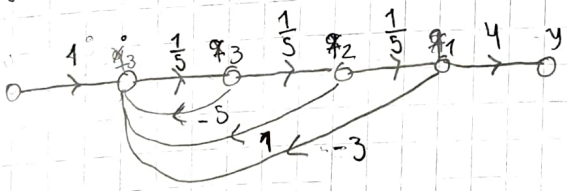
$$\begin{bmatrix} \dot{q}_1 \\ \dot{q}_2 \\ \dot{q}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -3 & -1 & -2 \end{bmatrix} \begin{bmatrix} q_1 \\ q_2 \\ q_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u \quad \Big| \quad \dddot{x} = -2\ddot{x} - \dot{x} - 3x$$

$$y = \begin{bmatrix} 4 & 0 & 0 \end{bmatrix} \begin{bmatrix} q_1 \\ q_2 \\ q_3 \end{bmatrix}$$

- Diagrama de bloques:

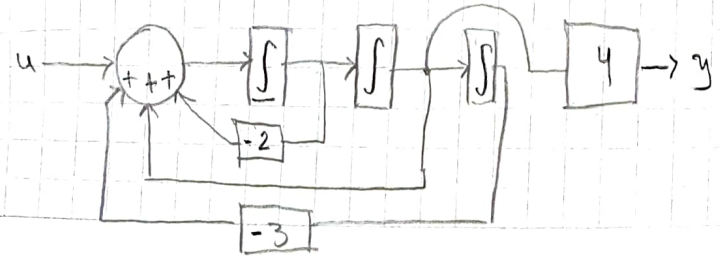


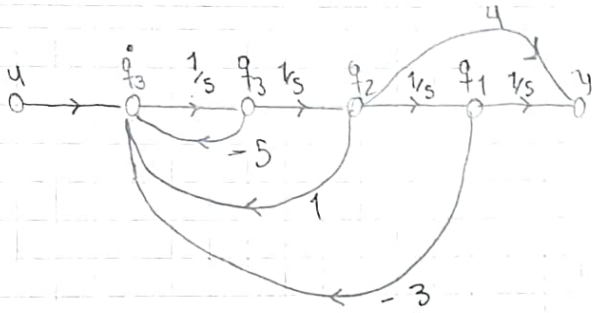
- Diagrama de flujo:



- $G(s) = \frac{4s}{s^3+2s^2+s+3} \rightarrow \dddot{x} + 2\ddot{x} + \dot{x} + 3$

$$\begin{bmatrix} \dot{q}_1 \\ \dot{q}_2 \\ \dot{q}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -3 & -1 & -2 \end{bmatrix} \begin{bmatrix} q_1 \\ q_2 \\ q_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u \; ; \; y = \begin{bmatrix} 0 & 4 & 0 \end{bmatrix} \begin{bmatrix} q_1 \\ q_2 \\ q_3 \end{bmatrix}$$





- $G(s) = \dfrac{6s^2+4s+2}{s^4+s^3+2s+3} \longrightarrow 6\ddot{x}+4\dot{x}+2x = y$

$\longrightarrow \dddot{x} - \ddot{x} + 2\dot{x} + 3x = u \rightarrow \dddot{x} = \ddot{x} - 2\dot{x} - 3x + u$

$\rightarrow q_1 = x \;;\; q_2 = \dot{q}_1 = \dot{x} \;;\; q_3 = \dot{q}_2 = \ddot{x} \;;\; q_4 = \dot{q}_3 = \dddot{x} \;;\; \dot{q}_4 = \ddot{x}$

$\rightarrow \dot{q}_4 = q_4 - 2q_2 - 3q_1 + u$

$$\begin{bmatrix} \dot{q}_1 \\ \dot{q}_2 \\ \dot{q}_3 \\ \dot{q}_4 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ -3 & -2 & 0 & 1 \end{bmatrix} \begin{bmatrix} q_1 \\ q_2 \\ q_3 \\ q_4 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \end{bmatrix} u \;;\; y = \begin{bmatrix} 2 & 4 & 6 & 0 \end{bmatrix} \begin{bmatrix} q_1 \\ q_2 \\ q_3 \\ q_4 \end{bmatrix}$$