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Diagrama de flujo de señal

Dibujar el diagrama de flujo de señal de los siguientes sistemas

★ $G(s) = \frac{4}{s^3+2s^2+s+3} = \frac{X(s)}{U(s)}$

$4U(s) = X(s)[s^3+2s^2+s+3]$

$4U = \dddot{x} + 2\ddot{x} + \dot{x} + 3x$

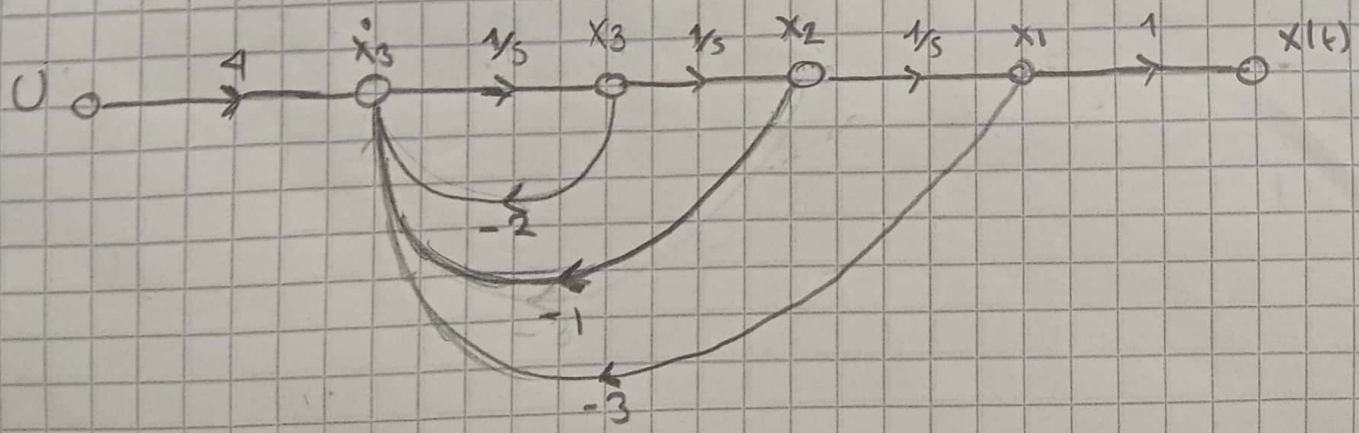
$\dddot{x} = 4U - 2\ddot{x} - \dot{x} - 3x$ ⇒ Definiendo estados

$x_1 = x \quad x_2 = \dot{x}_1 \quad x_3 = \dot{x}_2 \quad \dot{x}_3 = \ddot{x}_2$

$\dot{x}_3 = 4U - 2x_3 - x_2 - 3x_1$

$$\dot{\vec{x}} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -3 & -1 & -2 \end{bmatrix} \vec{x} + \begin{bmatrix} 0 \\ 0 \\ 4 \end{bmatrix} U$$

$$x_1 = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix} \vec{x} \quad \vec{0} \, U$$



★ $G(s) = \frac{4s}{s^3+2s^2+5+3} = \frac{4sX(s)}{U(s)} = \frac{Y(s)}{U(s)}$

$\frac{X(s)}{U(s)} = \frac{1}{s^3+2s^2+5+3} \Rightarrow s^3X(s) + 2s^2X(s) + 5X(s) + 3X(s) = U(s)$

$\dddot{X} + 2\ddot{x} + \dot{x} + 3x = u$ $\qquad y = 4sX(s) = 4\dot{x}$

Definiendo estados:

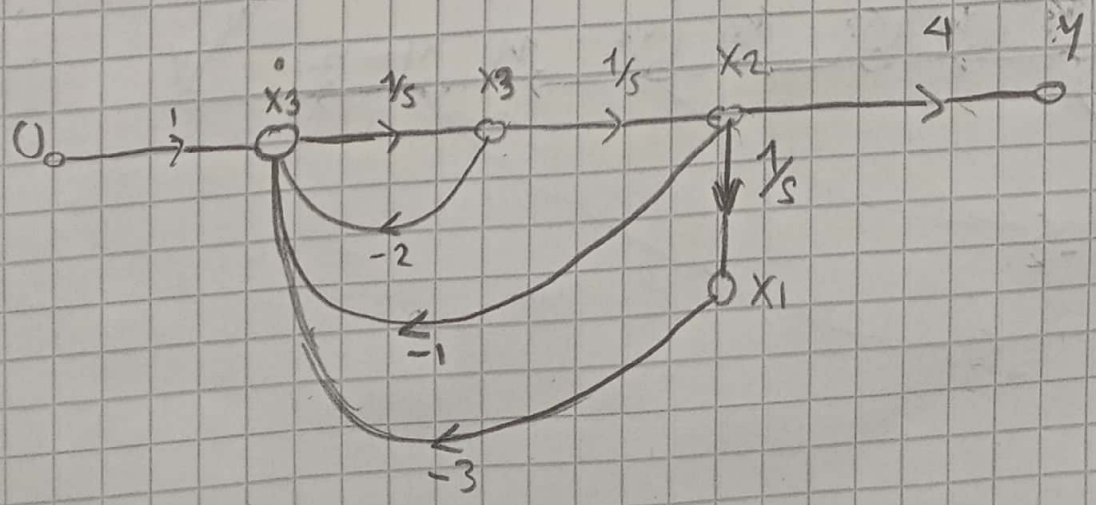
$x_1 = x \quad x_2 = \dot{x}_1 \quad x_3 = \dot{x}_2$

$y = 4x_2$

$\dot{x}_3 = u - 2x_3 - x_2 - 3x_1$

$$\dot{\vec{x}} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -3 & -1 & -2 \end{bmatrix} \vec{x} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$$

$$y = \begin{bmatrix} 0 & 4 & 0 \end{bmatrix} \vec{x} + \vec{0}\, u$$



$$G(s) = \frac{6s^2+4s+2}{s^4-s^3+2s+3} = \frac{[6s^2+4s+2]X(s)}{U(s)} = \frac{Y(s)}{U(s)}$$

$$\frac{X(s)}{U(s)} = \frac{1}{s^4-s^3+2s+3} \Rightarrow s^4X(s) - s^3X(s) + 2sX(s) + 3X(s) = U(s)$$

$$Y(s) = 6s^2X(s) + 4sX(s) + 2X(s)$$

$$\dddot{x} - \ddot{x} + 2\dot{x} + 3x = u \qquad y = 6\ddot{x} + 4\dot{x} + 2x$$

Definiendo estados

$x_1 = x \quad x_2 = \dot{x}_1 \quad x_3 = \dot{x}_2 \quad x_4 = \dot{x}_3$

$\dot{x}_4 = u + x_4 - 2x_2 - 3x_1 \qquad y = 6x_3 + 4x_2 + 2x_1$

$$\vec{\dot{x}} = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ -3 & -2 & 0 & 1 \end{bmatrix} \vec{x} + \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \end{bmatrix} u$$

$$y = \begin{bmatrix} 2 & 4 & 6 & 0 \end{bmatrix} \vec{x} + \vec{0}\,u$$