Tarea #7 Bono parcial.

1) $G(s) = \dfrac{4}{s^3+2s^2+s+3}$

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

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

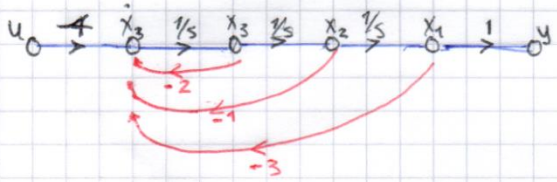
$4U(s) = (s^3+2s^2+s+3)X(s)$

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

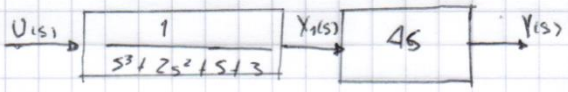
$4U = \dot{x}_3 + 2x_3 + x_2 + 3x_1 \qquad \dot{x}_3 = 4U - 2x_3 - x_2 - 3x_1$

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\\ \dot{x}_3\end{bmatrix} = \begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ -3 & -1 & -2\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix} + \begin{bmatrix}0\\ 0\\ 4\end{bmatrix} u \qquad y = \begin{bmatrix}1 & 0 & 0\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}$$

Diagrama de flujo de señal



2) $G(s) = \dfrac{4s}{s^3+2s^2+s+3}$



$\dfrac{X_1(s)}{U(s)} = \dfrac{1}{s^3+2s^2+s+3}$

$U(s) = (s^3+2s^2+s+3)X(s)$

$U(t) = \dddot{x} + 2\ddot{x} + \dot{x} + 3x$

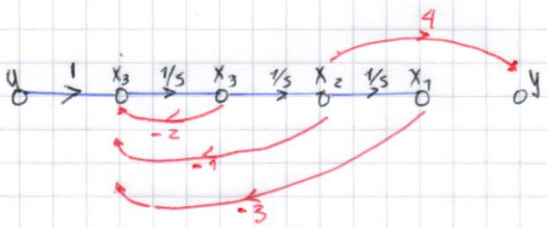
$U = \dot{x}_3 + 2x_3 + x_2 + 3x_1$

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

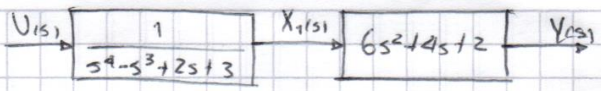
$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\\ \dot{x}_3\end{bmatrix} = \begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ -3 & -1 & -2\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix} + \begin{bmatrix}0\\ 0\\ 1\end{bmatrix} u \qquad y = \begin{bmatrix}0 & 4 & 0\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}$$

$Y = 4s(X_1(s))$

$Y = 4\dot{x}_1 = 4x_2$



3) $G(s) = \dfrac{6s^2+4s+2}{s^4-s^3+2s+3}$



$\dfrac{X_1(s)}{U(s)} = \dfrac{1}{s^4-s^3+2s+3}$

$X_1 = X \quad X_2 = \dot{X}_1 \quad X_3 = \dot{X}_2 \quad X_4 = \dot{X}_3$

$\dot{X}_4 = \dddot{X}$

$U(s) = (s^4-s^3+2s+3)X_1(s)$

$u = \ddddot{X} - \dddot{X} + 2\ddot{X} + 3\dot{X}$

$u = \dot{X}_4 - X_4 + 2X_2 + 3X_1$

$\dot{X}_4 = u + X_4 - 2X_2 - 3X_1$

$$\begin{bmatrix} \dot{X}_1 \\ \dot{X}_2 \\ \dot{X}_3 \\ \dot{X}_4 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ -3 & -2 & 1 & 1 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ X_3 \\ X_4 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \end{bmatrix} u$$

$\dfrac{Y(s)}{X_1(s)} = 6s^2+4s+2$

$Y(s) = (6s^2+4s+2)X_1(s)$

$Y(s) = 6X_3 + 4X_2 + 2X_1$

$$y = \begin{bmatrix} 2 & 4 & 6 & 0 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ X_3 \\ X_4 \end{bmatrix}$$