

bonificación Parcial 2

funciones de transferencia

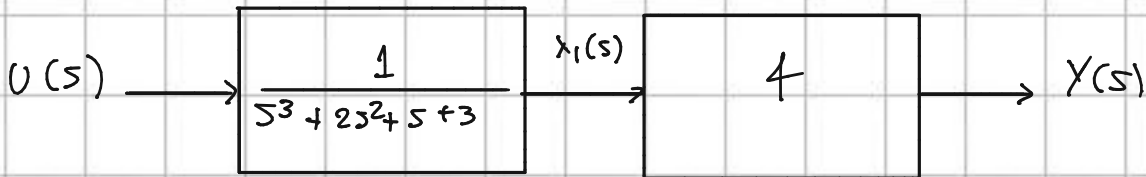
a) $G(s) = \frac{4}{s^3 + 2s^2 + s + 3}$

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

c) $G(s) = \frac{6s^2 + 4s + 2}{5^4 - s^3 + 2s + 3}$

Solución

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



$X_1(s)(s^3 + 2s^2 + s + 3) = U(s) \quad \ddot{x}_1 + 2\dot{x}_1 + x_1 + 3x_1 = u$

Se tiene

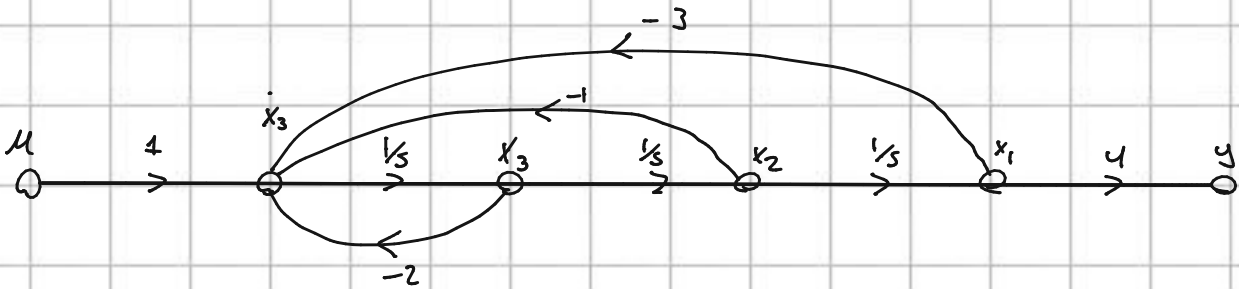
$x_1 = x_1 \quad x_2 = \dot{x}_1$
 $x_3 = \ddot{x}_1 = \dot{x}_2 \quad \dot{x}_3 = \ddot{x}_2$

$\dot{x}_3 + 2x_3 + x_2 + 3x_1 = u \quad \dot{x}_3 = -2x_3 - x_2 - 3x_1 + u$
 $y = 4x_1(s)$

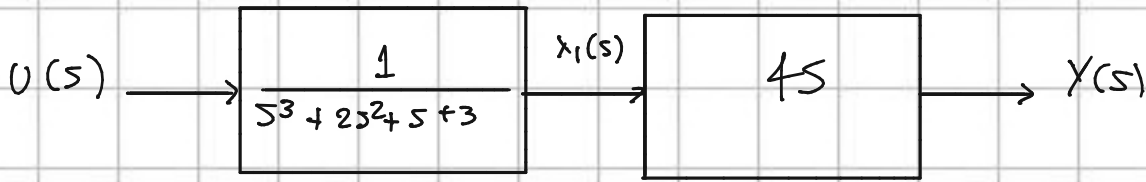
$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -3 & -1 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$$

$$y = \begin{bmatrix} 4 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

Diagrama de flujo de señal



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



$X_1(s)(s^3 + 2s^2 + s + 3) = U(s) \quad \ddot{x}_1 + 2\dot{x}_1 + x_1 + 3x_1 = u$

Se tiene

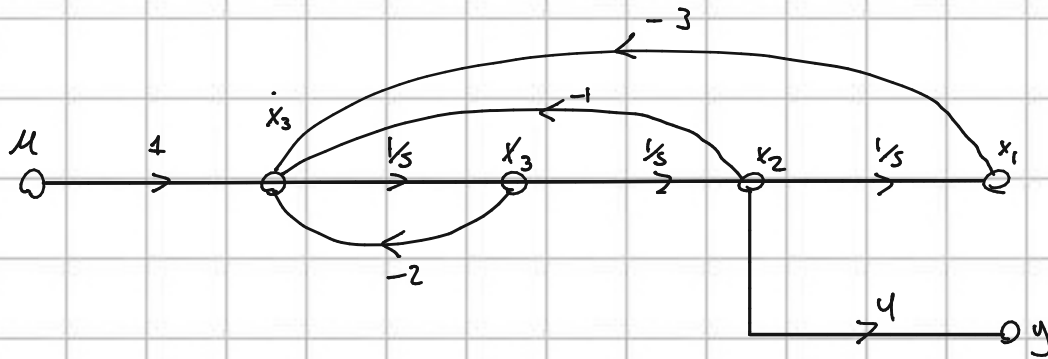
$x_1 = x_1 \quad x_2 = \dot{x}_1$
 $x_3 = \ddot{x}_1 = \dot{x}_2 \quad \dot{x}_3 = \ddot{x}_2$

$\dot{x}_3 + 2x_3 + x_2 + 3x_1 = u \quad \dot{x}_3 = -2x_3 - x_2 - 3x_1 + u$
 $y = 4\dot{x}_1 \quad y = 4x_2$

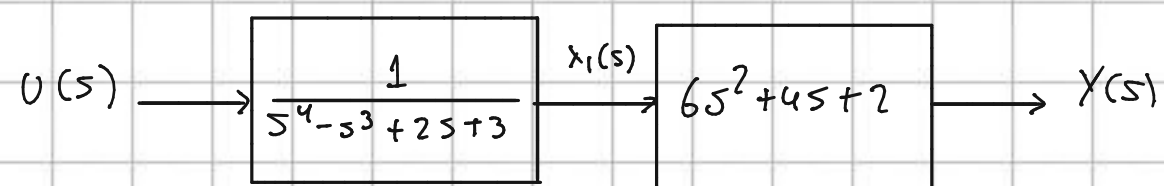
$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -3 & -1 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$$

$$y = \begin{bmatrix} 0 & 4 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

Diagrama de flujo de señal



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



$$X_1(s)(s^4 - s^3 + 2s + 3) = U(s) \quad \ddot{x}_1 - \dot{x}_1 + 2\dot{x}_1 + 3x_1 = u$$

Se tiene

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

$$x_3 = \ddot{x}_1 = x_4 \quad \dot{x}_4 = \ddot{\ddot{x}}_1$$

$$\dot{x}_4 - x_4 + 2x_2 + 3x_1 = u \quad \dot{x}_4 = x_4 - 2x_2 - 3x_1 + u$$

$$y(s) = X_1(s)(6s^2 + 4s + 2) \quad y = 6\dot{x}_1 + 4\ddot{x}_1 + 2x_1 \quad y = 6x_3 + 4x_4 + 2x_1$$

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \\ \dot{x}_4 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ -3 & -2 & 0 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \end{bmatrix} u$$

$$y = \begin{bmatrix} 2 & 4 & 6 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix}$$

Diagrama de flujo de señal

