

Bonificación

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

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

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

$$4u = \ddot{y} + 2\dot{y} + y + 3$$

$$\ddot{y} = -2\dot{y} - y - 3 + 4u$$

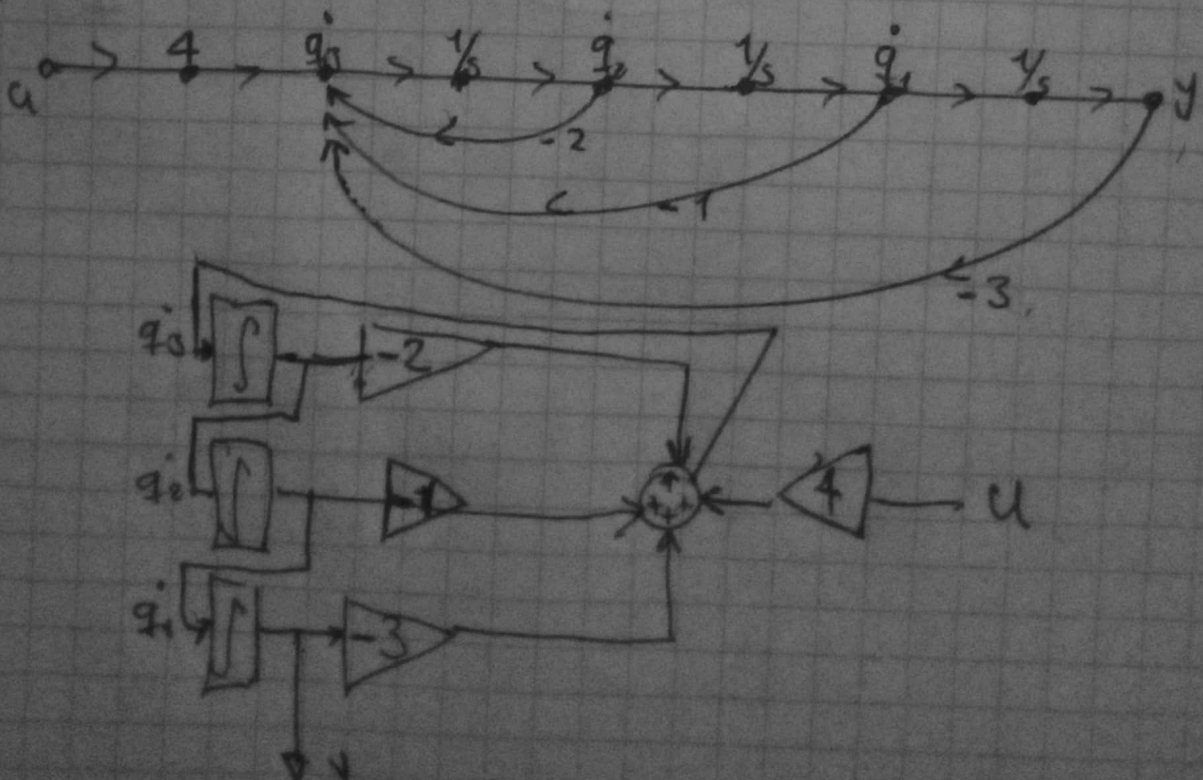
$$q_1 = y ; \quad q_2 = \dot{y} = \dot{q}_1$$

$$q_3 = \ddot{y} = \dot{q}_2 ; \quad \dot{q}_3 = \ddot{y}$$

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

$$y = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} q_1 \\ q_2 \\ q_3 \end{bmatrix} + \begin{bmatrix} 0 \end{bmatrix} u$$

Diagrama



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

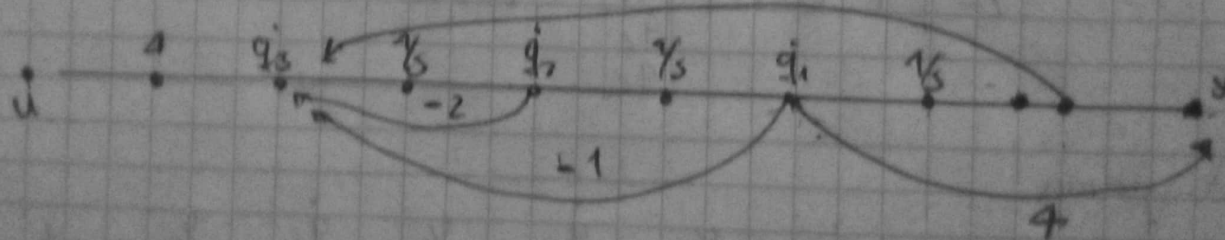
$$\frac{Y(s)}{U(s)} = \frac{4s}{s^3 + 2s^2 + s + 3}$$

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

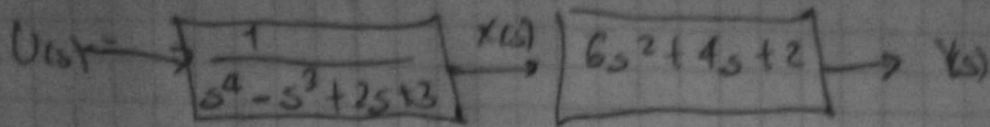
$$4u = \ddot{y} + 2\dot{y} + y + 3 \Rightarrow \dot{q}_3 = 4u - 2q_3 - q_2 - 3q_1$$

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

$$y = [0 \quad 1 \quad 0] \begin{bmatrix} q_1 \\ q_2 \\ q_3 \end{bmatrix} + [0] u$$



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



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

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

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

$$\dot{q}_1 = q_1 = 2q_2 + 3q_1 + u$$

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

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

$$\cancel{y} = y = 6\ddot{x} + 4\dot{x} + 2x$$

$$[y] = [2 \ 4 \ 6 \ 0] \begin{bmatrix} q_1 \\ q_2 \\ q_3 \\ q_4 \end{bmatrix}$$

