Brayan Roberto Pimiento Palacios 20202005042

Tarea Diagrama de flujo de Señal Bonificación

• Dibujar el diagrama de flujo de señal de los siguientes sistemas con su función de transferencia

(1) $G(s) = \dfrac{4}{S^3 + 2S^2 + S + 3} = \dfrac{X(s)}{U(s)}$, donde X es la transformada de la función de entrada y Y de la salida

• $X(s)\,[S^3 + 2S^2 + S + 3] = 4U(s)$

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

$\dddot{X}(t) + 2\ddot{X}(t) + \dot{X}(t) + 3X(t) = 4U(t)$

$\dddot{X} = 4U - 2\ddot{X} - \dot{X} - 3X$

— Variables de estado

$q_1 = x$

$q_2 = \dot{q}_1 = \dot{x}$

$q_3 = \dot{q}_2 = \ddot{x}$

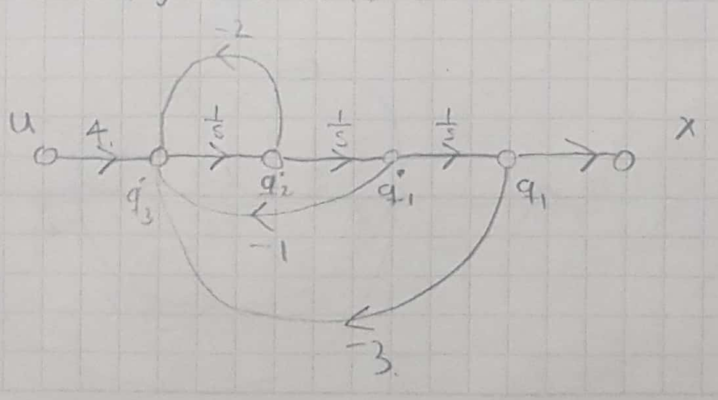
$\dot{q}_3 = \dddot{x}$

• Espacio de estados

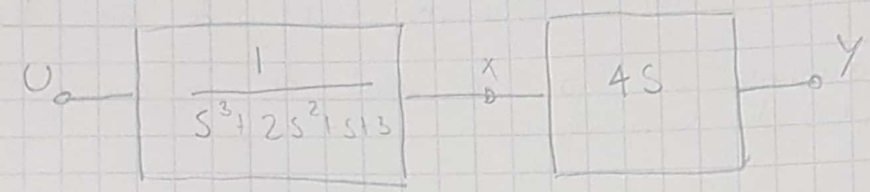
$$\begin{bmatrix} \dot{q}_1 \\ \dot{q}_2 \\ \dot{q}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -3 & -1 & -2 \end{bmatrix} \cdot \begin{bmatrix} q_1 \\ q_2 \\ q_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 4 \end{bmatrix} u$$

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

• Diagrama de flujo de señal



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



- $\dfrac{X}{U} = \dfrac{1}{s^3+2s^2+s+3}$

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

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

- $\dfrac{Y}{X} = 4s$

$Y = 4sX$

$Y = 4\dot{x}$

- Variables de estado

$q_1 = x$

$q_2 = \dot{q}_1 = \dot{x}$

$q_3 = \dot{q}_1 = \ddot{x} = \dot{q}_2$

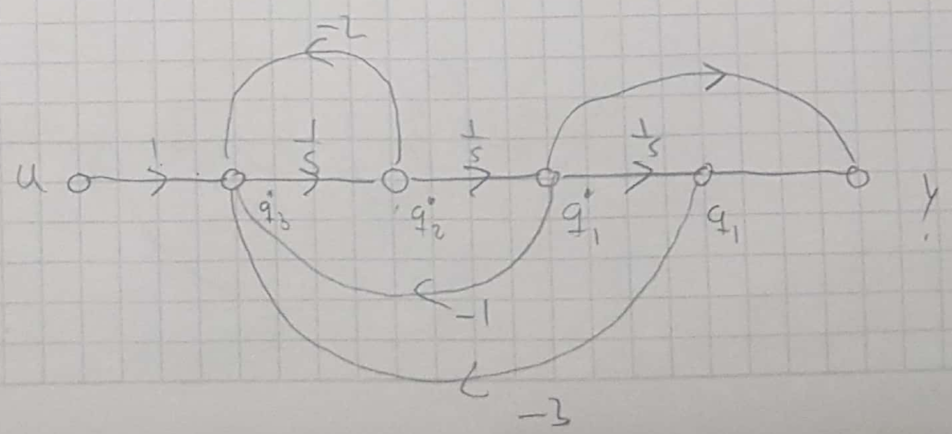
$\dot{q}_3 = \ddot{q}_2 = \dddot{x}$

- Espacio de estado

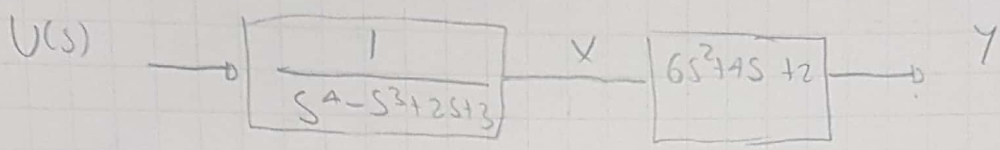
$$\begin{bmatrix} \dot{q}_1 \\ \dot{q}_2 \\ \dot{q}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -3 & -1 & -2 \end{bmatrix} \cdot \begin{bmatrix} q_1 \\ q_2 \\ q_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$$

$$y = \begin{bmatrix} 0 & 4 & 0 \end{bmatrix} \cdot \begin{bmatrix} q_1 \\ q_2 \\ q_3 \end{bmatrix} + [0]u$$

- Diagrama de flujo de señal



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



- $\dfrac{X}{U} = \dfrac{1}{s^4-s^3+2s+3}$

- $\dfrac{Y}{X} = 6s^2+4s+2$

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

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

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

- Variables de estado

$q_1 = x$

$q_2 = \dot{q}_1 = \dot{x}$

$q_3 = \dot{q}_2 = \ddot{q}_1 = \ddot{x}$

$q_4 = \dot{q}_3 = \ddot{q}_2 = \dddot{q}_1 = \dddot{x}$

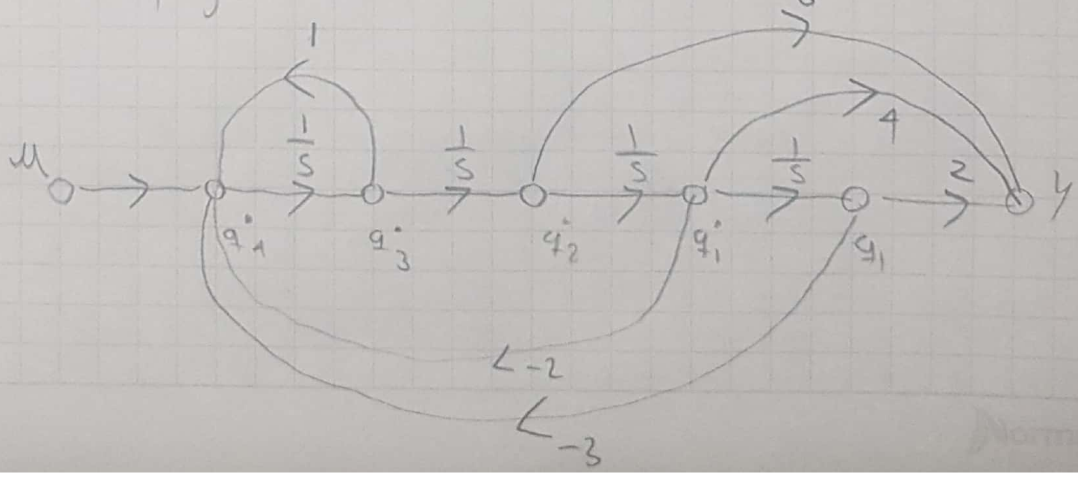
$\dot{q}_4 = \ddddot{x}$

Espacio de estados

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

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

- Diagrama de flujo de señal



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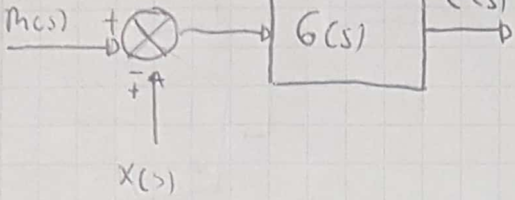
Tarea Clase 16/05/24. Simplificación

(a)



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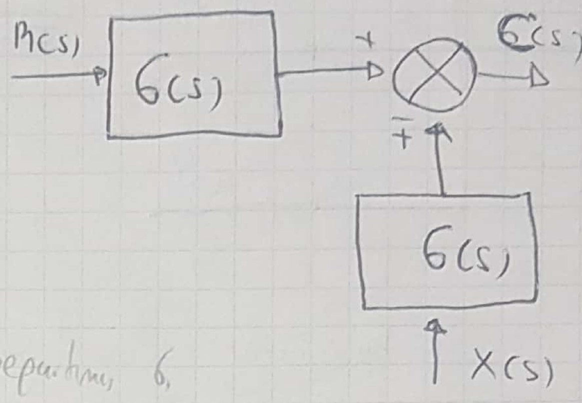
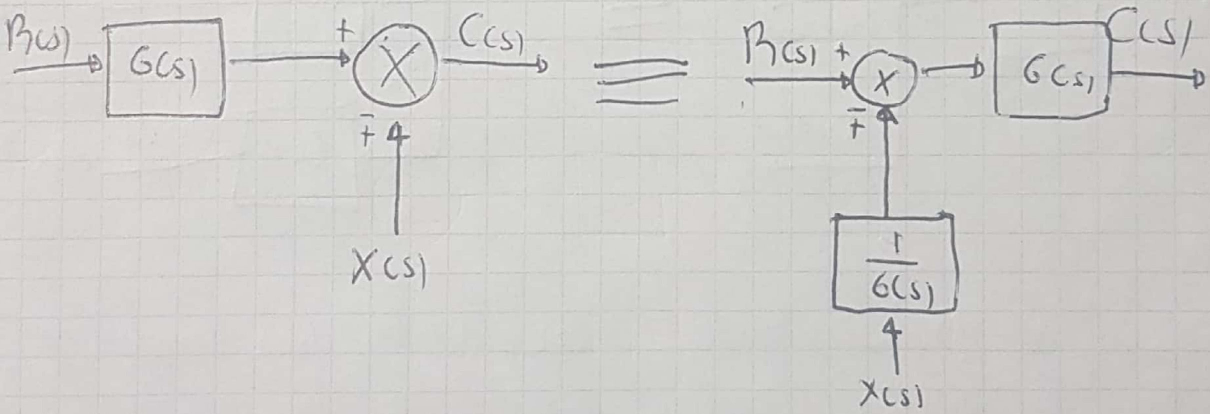


$(R_{(s)} \pm X_{(s)})\, G_{(s)} = C_{(s)}$ Repartimos G.

$R_{(s)}G_{(s)} \pm X_{(s)}G_{(s)} = C_{(s)}$

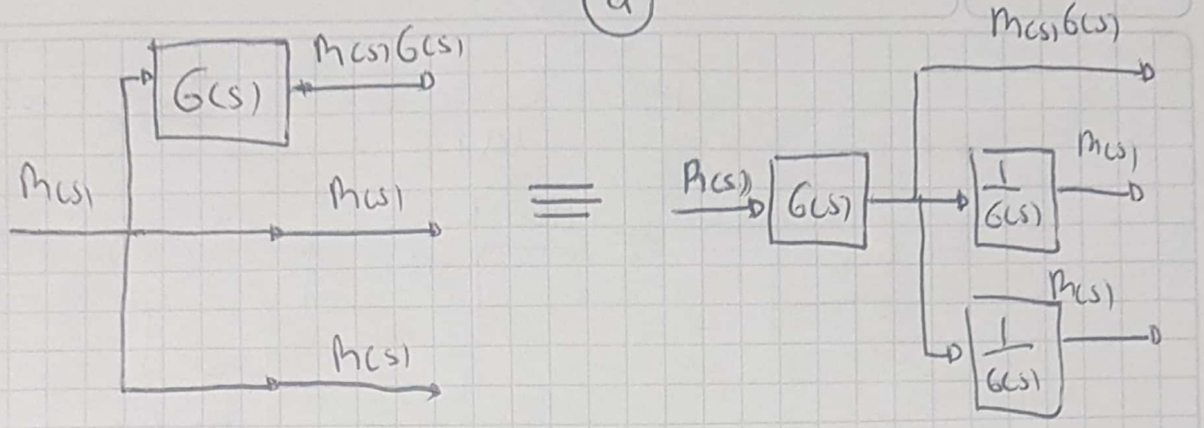
(b)



$R_{(s)}G_{(s)} \pm X_{(s)} = C_{(s)}$ Factor común!

$\left(R_{(s)} \pm \frac{X_{(s)}}{G_{(s)}}\right) G_{(s)} = C_{(s)}$

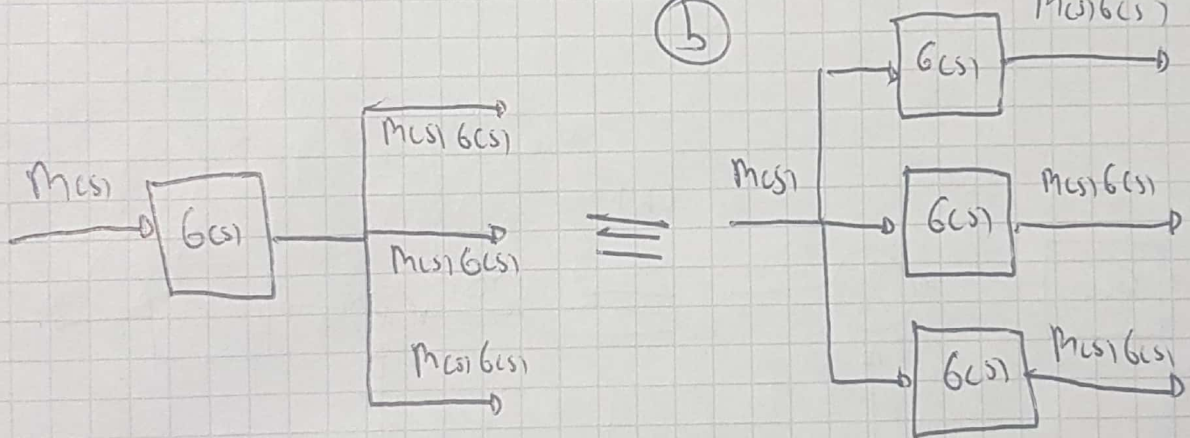
(a)



Casos 3 Salidas

1	$R(s)G(s) = R(s)G(s)$	=	1	$R(s)G(s) = R(s)G(s)$
2	$R(s) = R(s)$	=	2	$R(s)G(s) \Rightarrow \frac{R(s)\cancel{G(s)}}{\cancel{G(s)}} = R(s)$
3	$R(s) = R(s)$	=	3	$R(s)G(s) \Rightarrow \frac{R(s)\cancel{G(s)}}{\cancel{G(s)}} = R(s)$

(b)



Casos 3 Salidas

1	$R(s)G(s) = R(s)G(s)$	=	1	$R(s)G(s) = R(s)G(s)$
2	$R(s)G(s) = R(s)G(s)$	=	2	$R(s)G(s) = R(s)G(s)$
3	$R(s)G(s) = R(s)G(s)$	=	3	$R(s)G(s) = R(s)G(s)$

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Dinamicos Tarea bonificación

$$0{,}16 = e^{\frac{-\zeta\pi}{\sqrt{1-\zeta^2}}}$$

$\zeta = 0.504$

$$\ln(0{,}16) = \frac{-\zeta\pi}{\sqrt{1-\zeta^2}}$$

$$\ln(0{,}16)^2 = \frac{\zeta^2\pi}{(1-\zeta^2)}$$

$$\ln(0{,}16)^2(1-\zeta^2) = \zeta^2\pi^2$$

$$\ln(0{,}16)^2 - \zeta^2\ln(0{,}16)^2 = \zeta^2\pi^2$$

$$\ln(0{,}16)^2 = \zeta^2\left[\pi^2 + (\ln(0{,}16))^2\right]$$

$$\sqrt{\zeta^2} = \sqrt{\frac{\ln(0{,}16)^2}{\pi^2 + (\ln(0{,}16))^2}}$$

$$\zeta = \sqrt{\frac{\ln(0{,}16)^2}{\pi^2 + (\ln(0{,}16))^2}} = 0{,}503\ldots$$