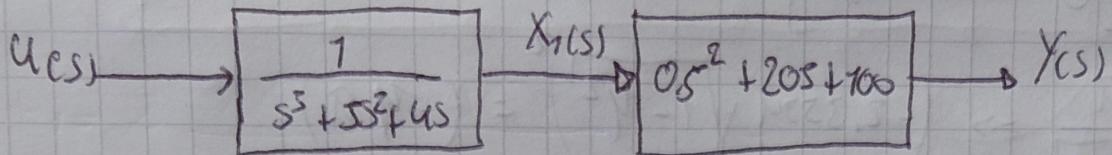


Tarea 6

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Codi: 20182005139

$$G(s) = \frac{20(s+2)}{s(s+1)(s+4)} \quad \left\{ \begin{array}{l} 0,5\% = 9,5\% \\ t_s = 0,74 s \text{ sg} \end{array} \right.$$



$$\frac{X_1(s)}{U(s)} = \frac{1}{s^3 + 5s^2 + 4s} \Rightarrow (s^3 + 5s^2 + 4s) X_1(s) = U(s)$$

$$\Rightarrow \ddot{X}_1 + 5\dot{X}_1 + 4X_1 = U$$

$$X_1 = \dot{X}_1$$

$$\ddot{X}_3 + 5\dot{X}_3 + 4X_2 = U$$

$$X_2 = \dot{X}_1$$

$$\Rightarrow \ddot{X}_3 = -5\dot{X}_3 - 4X_2 + U$$

$$X_3 = \dot{X}_2 = \dot{X}_1$$

$$\ddot{X}_3 = \ddot{\dot{X}}_1$$

$$Y(s) = (b_2 s^2 + b_1 s + b_0) X_1(s)$$

$$(0.5s^2 + 20s + 100) X_1(s)$$

$$(20s + 100) X_1(s) \rightarrow 20\ddot{X}_1 + 100\dot{X}_1$$

$$20X_2 + 100X_1$$

$$Y = 20X_2 + 100X_1$$

$$= \begin{bmatrix} \dot{X}_1 \\ \dot{X}_2 \\ \dot{X}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 6 & -4 & -3 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} [U]$$

$$Y = \begin{bmatrix} 100 & 20 & 0 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix}$$

$$0,098 = e^{-\left(\frac{y}{\pi} \sqrt{1-y^2}\right) \times 200}$$

$$- \left(\frac{y}{\pi} \sqrt{1-y^2}\right)$$

$$0,098 = e^{-}$$

$$\ln(0,098) = \ln\left[e^{-\left(\frac{y}{\pi} \sqrt{1-y^2}\right)}\right]$$

$$\Rightarrow -2,3534 = -\frac{y}{\sqrt{1-y^2}} \Rightarrow \left(-2,3534 \sqrt{1-y^2}\right)^2 = (-y)^2$$

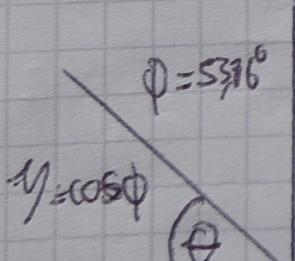
$$\Rightarrow 5,5407 - 5,5407 y^2 = y^2 \pi^2$$

$$\Rightarrow 5,5407 = y^2 \pi^2 + 5,5407 y^2 \Rightarrow y^2 (\pi^2 + 5,5407) = 5,5407$$

$$y^2 = \frac{5,5407}{\pi^2 + 5,5407} \rightarrow y = \sqrt{\frac{5,5407}{\pi^2 + 5,5407}} \Rightarrow y = 0,5996$$

$$S = T + jwL$$

$$y \sin \arccos(0,5996)$$

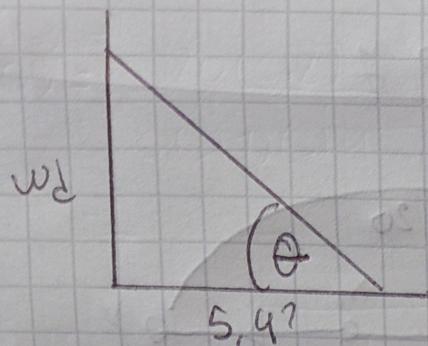


$$y \sin \arccos(0,5996) \quad \Rightarrow \quad 0,74 = \frac{y}{T} \quad \Rightarrow \quad T = \frac{y}{0,74} = 5,405$$

$$S = T + jwL$$

$$T = y \omega n \Rightarrow \omega n = 9,02 \text{ rad/s}$$

$$T = \gamma w_n$$



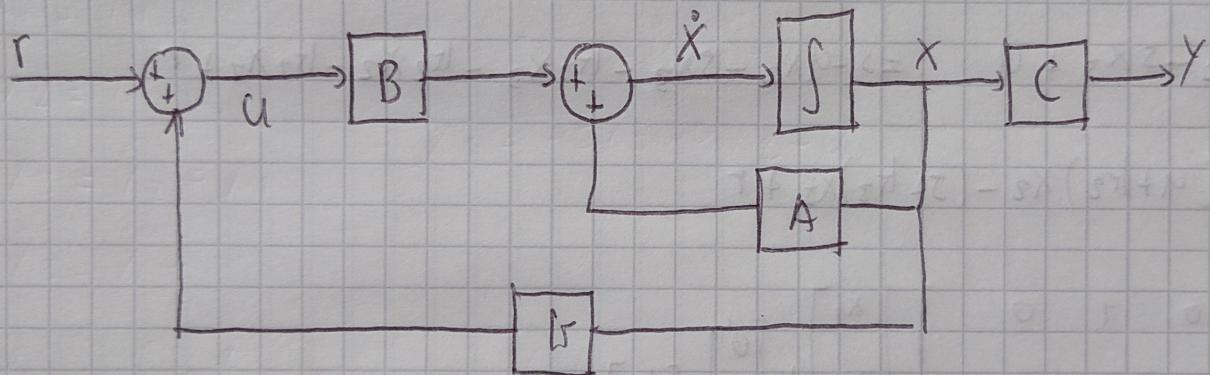
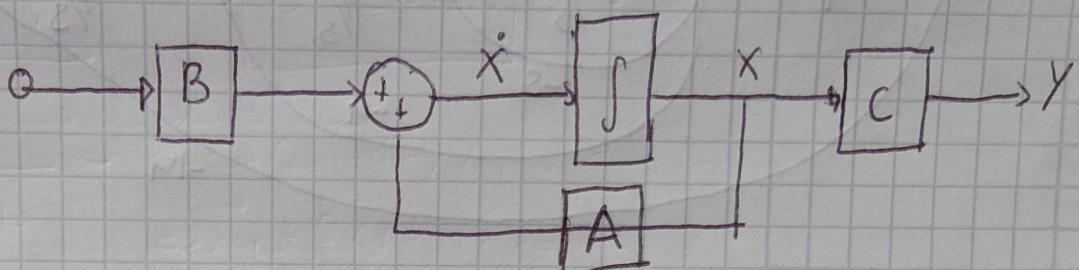
$$\tan \phi = \frac{wd}{5,4?}$$

$$\tan(53,76) \cdot 5,4? = wd$$

$$wd = 7,21$$

$$\dot{x} = Ax + Bu$$

$$y = cx$$

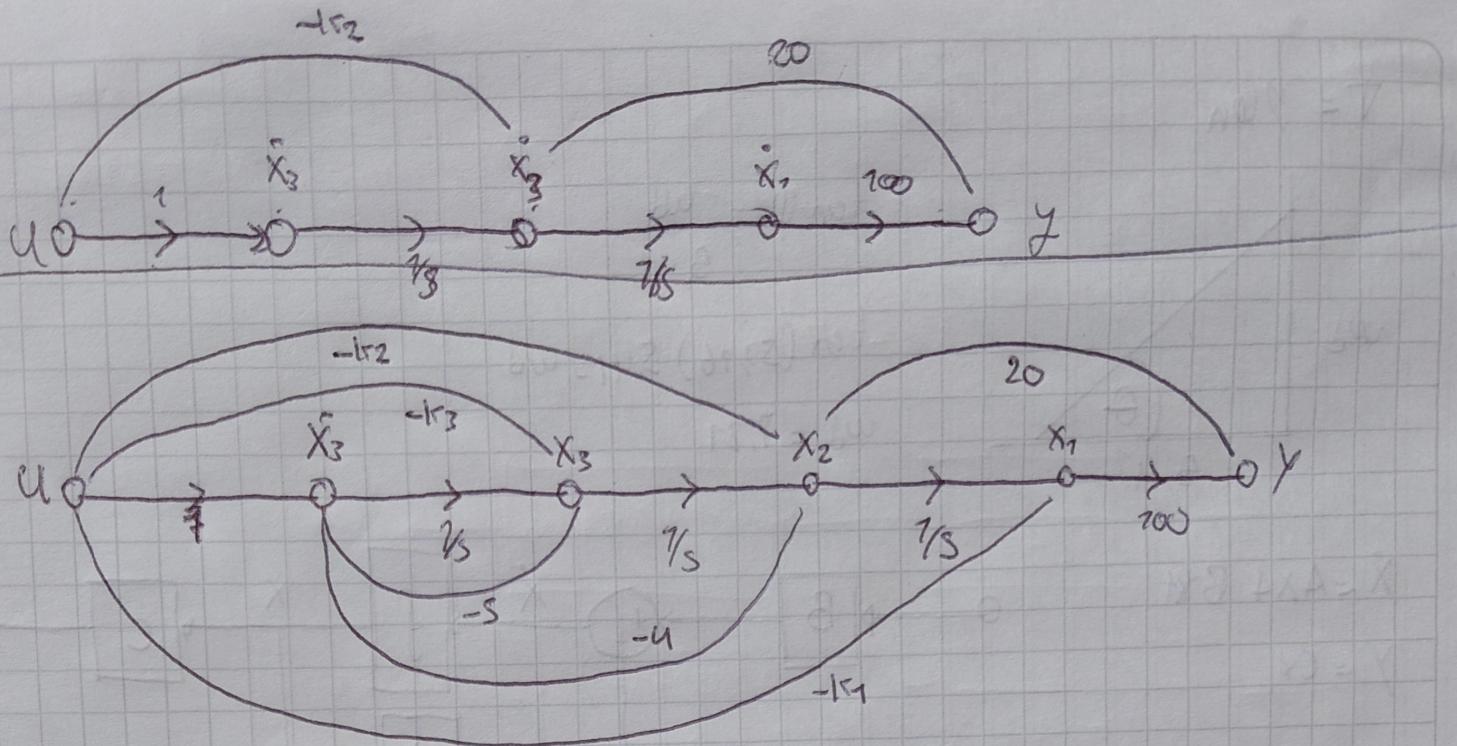


$$\dot{x} = Ax + Bu \rightarrow \dot{x} = Ax + B(-f x + r)$$

$$\dot{x} = -Bf x + Br + Ax \rightarrow \dot{x} = (A - Bf)x + Br$$

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

$$Y = \begin{bmatrix} 100 & 20 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$



$$\dot{x}_3 = -k_1 x_1 - k_2 x_2 - k_3 x_3 + u \Rightarrow -k_1 x_1 - k_2 x_2 - k_3 x_3 - k_2 x_2 - k_1 x_1 + r$$

$$\Rightarrow -k_1 x_1 - (k_1 + k_2) x_2 - (k_3 + k_2) x_3 + r$$

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -k_1 & -(k_1+k_2) & (k_3+k_2) \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} [r]$$

$$\det [sI - (A - BR)] = s^3 + (s + k_3)s^2 + (u + k_2)s + k_m = r$$

	$s\gamma_{1,1}$		$(s + s_u + j\gamma_{1,2})(s + s_n u + j\gamma_{1,2})$
$-s, u$		$-s, n$	$(s + s, 1)$
		$+j\gamma_{1,1}$	

$$S^3 + 15,4 S^2 + 136,22 S + 413,83 = 0$$

$$S^3 + (S + k_3) S^2 + (4 + k_2) S + k_1 = S^3 + 15,9 S^2 + 736,22 S + 413,83$$

$$(S + k_3) \cancel{S^2} - 15,9 \cancel{S^2} \rightarrow S + k_3 = 75,9 \quad k_3 = 70,9$$

$$(4 + k_2) \cancel{S} = 736,22 \cancel{S}$$

$$4 + k_2 = 736,22 \rightarrow k_2 = 732,22 \rightarrow k_1 = 413,83$$

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 413,8 - 736,22 - 73,9 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} [r]$$