Tarea 3

$$\begin{bmatrix}\dot d\\ \ddot d\end{bmatrix} = \begin{bmatrix}0 & 1\\ -\frac{k}{m} & -\frac{b}{m}\end{bmatrix}\begin{bmatrix} d\\ \dot d\end{bmatrix} + \begin{bmatrix}0\\ \frac{a}{m}\end{bmatrix} p$$

$x_1 = d$

$x_2 = \dot d$

$x_2 = \dot x_1 \rightarrow \dot d = \dot d$

$$y = \begin{bmatrix} 1 & 0 \end{bmatrix}\begin{pmatrix} d\\ \dot d\end{pmatrix} + 0\,p$$

$$\ddot d = -\frac{b}{m}\dot d - \frac{k}{m} d + \frac{a}{m} p$$

Saco el punto de eq

$\dot x_1 = 0 \rightarrow$ $\boxed{\dot d_e = 0}$

$$0 = -\frac{0,4}{1} d + \frac{0,1}{1} p$$

$$\frac{0,4}{\cancel{1}} d_e = \frac{0,1}{\cancel{1}} p \qquad d_e = \frac{0,1}{0,4} p \rightarrow \boxed{d_e = \frac{p}{4}}$$

$$y = (1, 0)\begin{bmatrix} p/4\\ 0\end{bmatrix} \qquad \boxed{y_e = \frac{p}{4}}$$

Tarea 1

$$m\ddot d = -b\dot d - kd + ap$$

$$\ddot d = -\frac{b}{m}\dot d - \frac{k}{m} d + \frac{a}{m} p$$

$$\boxed{\begin{bmatrix}\dot d\\ \ddot d\end{bmatrix} = \begin{bmatrix}0 & 1\\ -\frac{k}{m} & -\frac{b}{m}\end{bmatrix}\begin{bmatrix} d\\ \dot d\end{bmatrix} + \begin{bmatrix}0\\ a/m\end{bmatrix} p}$$

Tarea #2

1) $V_i = V_{R1} + V_{c1}$

$V_i = I_1 \cdot R_1 + V_{c1}.$

2) $V_{c1} = V_{R2} + V_{c2}.$

$V_{c1} = I_2 R_2 + V_{c2}.$

$V_{c1} = \frac{1}{C_1}\int (I_1 - I_2)\, dt$

$V_{c2} = \frac{1}{C_2}\int I_2\, dt. \rightarrow \boxed{I_2 = \dot{V}_{c2} \cdot C_2}$

$\rightarrow \dot{V}_{c1} \cdot C_1 = I_1 - I_2.$

$\dot{V}_{c1} \cdot C_1 = I_1 - \dot{V}_{c2} \cdot C_2.$

$\boxed{I_1 = \dot{V}_{c1} \cdot C_1 + \dot{V}_{c2} \cdot C_2.}$

Sustituyo.

$V_i = R_1 \cdot \dot{V}_{c1} \cdot C_1 + R_1 \cdot \dot{V}_{c2}\, C_2. + V_{c1}.$

$V_{c1} = R_2 \cdot \dot{V}_{c2}\, C_2 + V_{c2}.$

Despejo la derivada más grande.

$\dot{V}_{c1} = \frac{1}{R_1 C_1} V_i - \frac{\cancel{R_1} \cdot C_2}{\cancel{R_1} C_1} \dot{V}_{c2} - \frac{1}{R_1 C_1} V_{c1}.$

$\boxed{\dot{V}_{c2} = \frac{1}{R_2 \cdot C_2} \cdot V_{c1} - \frac{1}{R_2 C_2} \cdot V_{c2}.}$ Meto en $\dot{V}_{c1}$ $\dot{V}_{c2}$

$\boxed{\dot{V}_{c1} = \frac{1}{R_1 C_1} V_i - \frac{\cancel{C_2}}{C_1 R_2 \cancel{C_2}} V_{c1}. + \frac{\cancel{C_2}}{C_1 R_2 \cancel{C_2}} V_{c2} - \frac{1}{R_1 C_1} V_{c1}}$

$A = \begin{bmatrix} -\frac{1}{C_1 R_2} - \frac{1}{R_1 C_1} & \frac{1}{C_1 R_2} \\ \frac{1}{R_2 C_2} & -\frac{1}{R_2 C_2} \end{bmatrix} \begin{bmatrix} V_{c1} \\ V_{c2} \end{bmatrix} \quad B = \begin{bmatrix} \frac{1}{R_1 C_1} \\ 0 \end{bmatrix} V_i \quad C = [1 \; 0] \quad D = [0].$