SISTEMAS DE EDO LINEALES.

$x_1(t) \quad x_2(t)$

$$\frac{dx_1(t)}{dt} = a_{11}x_1(t) + a_{12}x_2(t)$$

$$\frac{dx_2(t)}{dt} = a_{21}x_1(t) + a_{22}x_2(t)$$

S(2) EDO L (1) H.

$$x_2(t) = \frac{1}{a_{12}}\left(\frac{dx_1(t)}{dt} - a_{11}x_1(t)\right)$$

$$\frac{d}{dt}\left(\frac{1}{a_{12}}\left(\frac{dx_1(t)}{dt} - a_{11}x_1(t)\right)\right) = a_{21}x_1(t) + a_{22}\left(\frac{1}{a_{12}}\left(\frac{dx_1(t)}{dt} - a_{11}x_1(t)\right)\right)$$

$$\frac{1}{a_{12}}\frac{d^2x_1(t)}{dt^2} - \frac{a_{11}}{a_{12}}\frac{dx_1(t)}{dt} = a_{21}x_1(t) + \frac{a_{22}}{a_{12}}\frac{dx_1(t)}{dt} - \frac{a_{22}a_{11}}{a_{12}}x_1(t)$$

$$\frac{d^2x_1(t)}{dt^2} - a_{11}\frac{dx_1(t)}{dt} = a_{21}a_{12}x_1(t) + a_{22}\frac{dx_1(t)}{dt} - a_{22}a_{11}x_1(t)$$

$$\frac{d^3x_1(t)}{dt^2} + \left(-a_{11} - a_{22}\right)\frac{dx_1(t)}{dt} + \left(-a_{21}a_{12} + a_{22}a_{11}\right)x_1(t) = 0$$

EDO L(2) CC H.

$$\frac{dx_1(t)}{dt} = 2x_1(t) + 3x_2(t) \qquad A = \begin{bmatrix} 2 & 3 \\ -1 & 2 \end{bmatrix}$$

$$\frac{dx_2(t)}{dt} = -x_1(t) + 2x_2(t)$$

$$\frac{d^2x_1(t)}{dt} + (-4)\frac{dx_1(t)}{dt} + (4+3)\,x_1(t) = 0$$

$$\frac{d^2x_1(t)}{dt} - 4\frac{dx_1(t)}{dt} + 7x_1(t) = 0$$

$$m^2 - 4m + 7 = 0$$

$$m = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(7)}}{2}$$

$$m = \frac{4 \pm \sqrt{16-28}}{2}$$

$$m = \frac{4}{2} \pm \frac{\sqrt{12}}{2}i$$

$$m = 2 \pm \sqrt{3}\,i$$

$$x_1(t) = C_1 e^{2t}(\cos(\sqrt{3}t)) + C_2 e^{2t}\operatorname{sen}(\sqrt{3}t).$$

$$\frac{dx_1(t)}{dt} = -\sqrt{3}C_1 e^{2t}\operatorname{sen}(\sqrt{3}t) + 2C_1 e^{2t}\cos(\sqrt{3}t) +$$

$$+\sqrt{3}C_2 e^{2t}\cos(\sqrt{3}t) + 2C_2 e^{2t}\operatorname{sen}(\sqrt{3}t)$$

$$= (2C_1 + \sqrt{3}C_2)e^{2t}\cos(\sqrt{3}t) + (-\sqrt{3}C_1 + 2C_2)e^{2t}\operatorname{sen}(\sqrt{3}t)$$

$$x_2(t) = \frac{1}{3}\left((2C_1+\sqrt{3}C_2)e^{2t}\cos(\sqrt{3}t) + (-\sqrt{3}C_1 + 2C_2)e^{2t}\operatorname{sen}(\sqrt{3}t)\right) -$$

$$-\frac{2}{3}\left(C_1 e^{2t}\cos(\sqrt{3}t) + C_2 e^{2t}\operatorname{sen}(\sqrt{3}t)\right)$$

$$\begin{cases} x_2(t) = \frac{\sqrt{3}}{3}C_2 e^{2t}\cos(\sqrt{3}t) - \frac{\sqrt{3}}{3}C_1 e^{2t}\operatorname{sen}(\sqrt{3}t). \\ x_1(t) = C_1 e^{2t}\cos(\sqrt{3}t) + C_2 e^{2t}\operatorname{sen}(\sqrt{3}t) \end{cases}$$

$$\frac{d^3y(t)}{dt^3} - 2\frac{d^2y(t)}{dt^2} + 4\frac{dy(t)}{dt} - 5y(t) = 0$$

EDO (3) L cc H.

$$\frac{dy(t)}{dt} \Rightarrow \frac{dy_1(t)}{dt} = y_2(t)$$

$$\frac{d^2y(t)}{dt^2} \Rightarrow \frac{dy_2(t)}{dt} = y_3(t)$$

$$\frac{d^3y(t)}{dt^3} = \frac{dy_3(t)}{dt}$$

$$\frac{dy_3(t)}{dt} = 5y_1(t) - 4y_2(t) + 2y_3(t)$$

$$\boxed{\begin{aligned} \frac{dy_1(t)}{dt} &= y_2(t) \\ \frac{dy_2(t)}{dt} &= y_3(t) \\ \frac{dy_3(t)}{dt} &= 5y_1(t) - 4y_2(t) + 2y_3(t). \end{aligned}}$$

S(3) EDOL(1) H.

$$\frac{d}{dt}\begin{bmatrix} y_1(t) \\ y_2(t) \\ y_3(t) \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 5 & -4 & 2 \end{bmatrix} \times \begin{bmatrix} y_1(t) \\ y_2(t) \\ y_3(t) \end{bmatrix}$$

$$\frac{dx_1(t)}{dt} = 2x_1(t) + 3x_2(t)$$

$$\frac{dx_2(t)}{dt} = -x_1(t) + 2x_2(t)$$

$$\begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix} \qquad \frac{d}{dt}\begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix} \Rightarrow \begin{bmatrix} \frac{dx_1(t)}{dt} \\ \frac{dx_2(t)}{dt} \end{bmatrix}$$

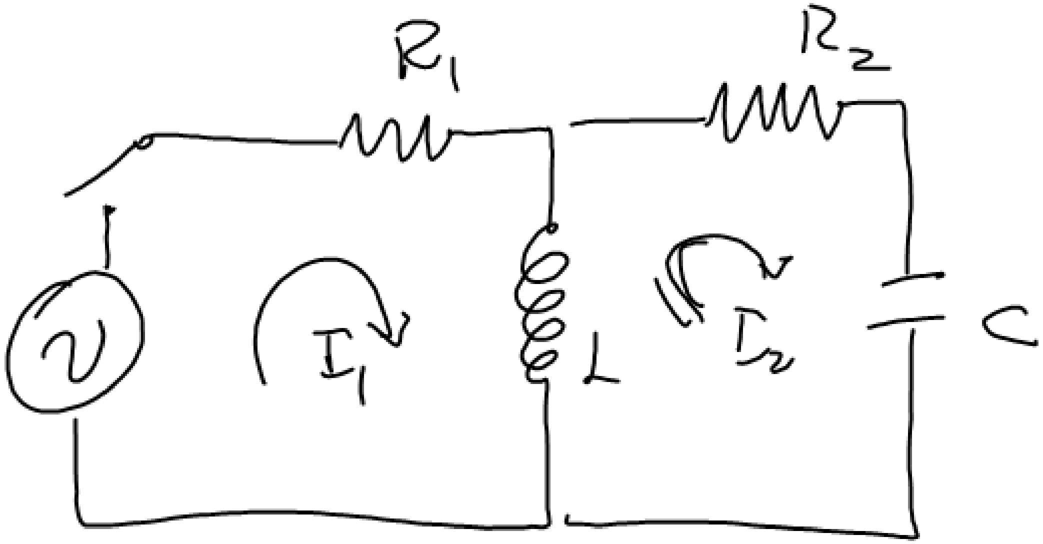
$$\frac{d}{dt}\begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix} = \begin{bmatrix} 2 & 3 \\ -1 & 2 \end{bmatrix}\begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix}$$

$$\frac{d}{dt}\bar{x} = A\bar{x}$$

$$\bar{x}_g(t) = \left[e^{At}\right]\bar{x}(0) \qquad \bar{x}(0) = \begin{bmatrix} c_1 \\ c_2 \\ \vdots \\ c_n \end{bmatrix}$$

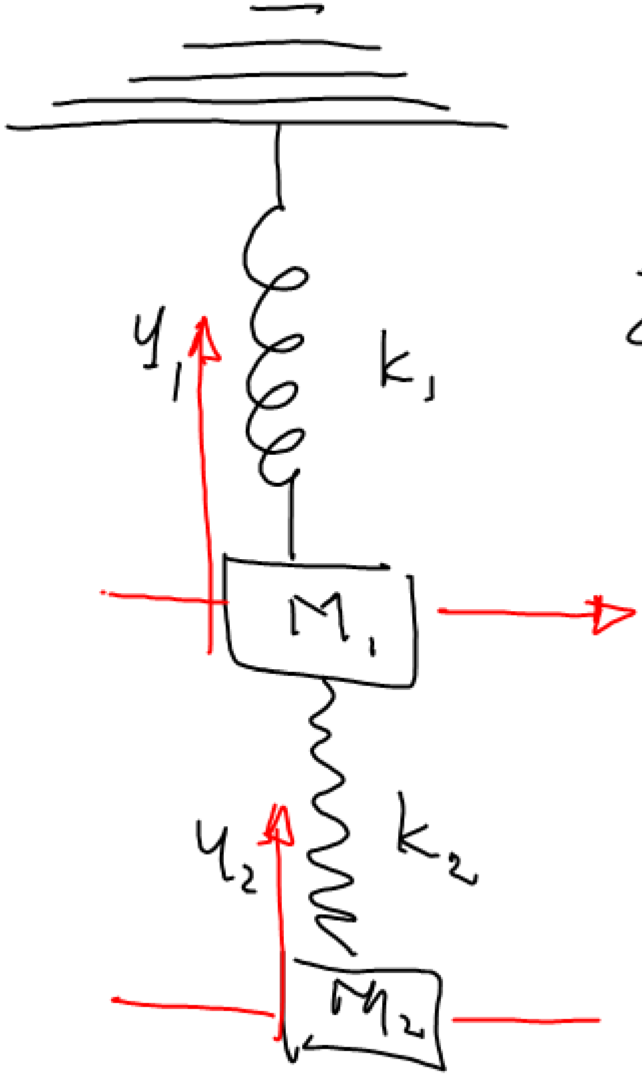
$$\frac{d}{dt}\left[e^{At}\right] = A\left[e^{At}\right]$$

$$e^{At}\Big]_{t=0} = \underline{I}$$

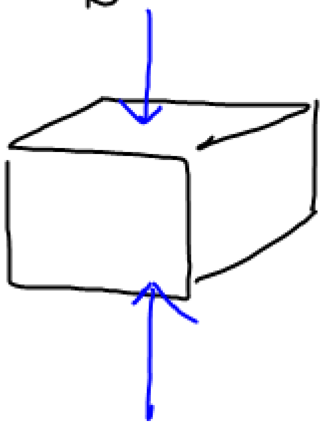


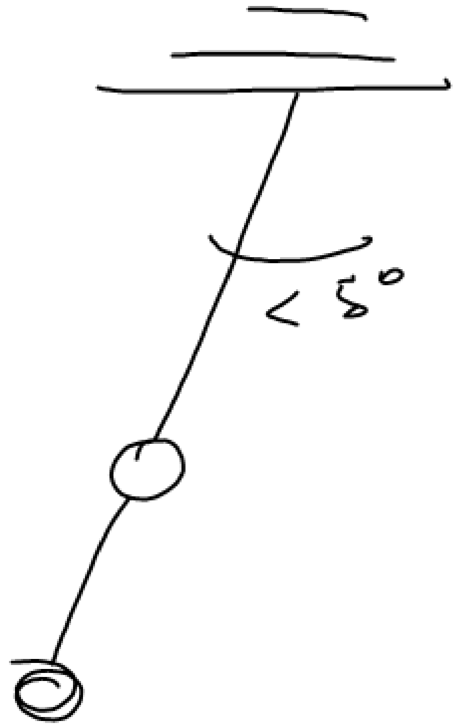
$$u(t-a)\,120\cos\left(60(t-a)\right) = R_1 I_1 + L\left(\frac{dI_1}{dt} - \frac{dI_2}{dt}\right)$$

$$0 = R_2 I_2 + \frac{1}{C}\int I_2\,dt.$$



$$\Sigma F = k y$$




< 5°