

$$m_1 = m_2 = 1$$

$$\frac{d}{dt} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ -10 & 4 & 0 & 0 \\ 4 & -4 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix}$$

$$m_1 \frac{d^2 x_1}{dt^2} = -k_1(x_1) + k_2(x_2 - x_1)$$

$$m_2 \frac{d^2 x_2}{dt^2} = -k_2(x_2 - x_1)$$

$$\frac{dx_1}{dt} = x_3$$

$$\frac{dx_2}{dt} = x_4$$

$$\frac{dx_3}{dt} = -\frac{k_1}{m_1}(x_1) + \frac{k_2}{m_1}(x_2 - x_1)$$

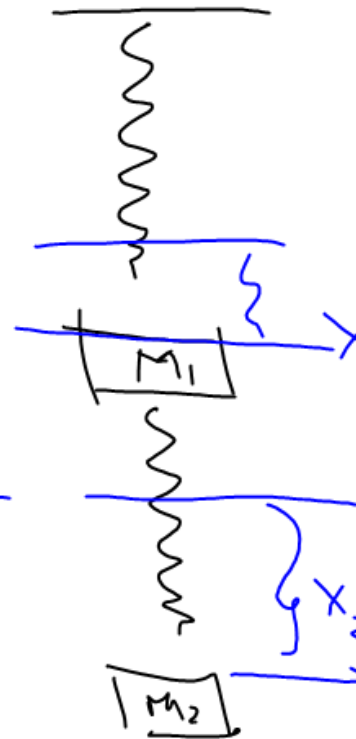
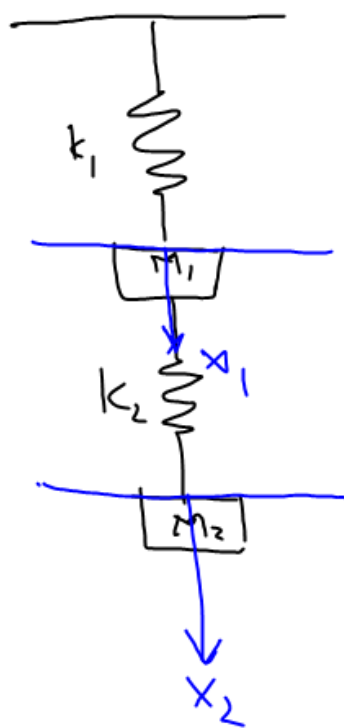
$$\frac{dx_4}{dt} = -\frac{k_2}{m_2}(x_2 - x_1)$$

$$\frac{dx_1}{dt} = x_3$$

$$\frac{dx_2}{dt} = x_4$$

$$\frac{dx_3}{dt} = (-k_1 - k_2)x_1 + k_2(x_2)$$

$$\frac{dx_4}{dt} = (k_2)x_1 - k_2(x_2)$$

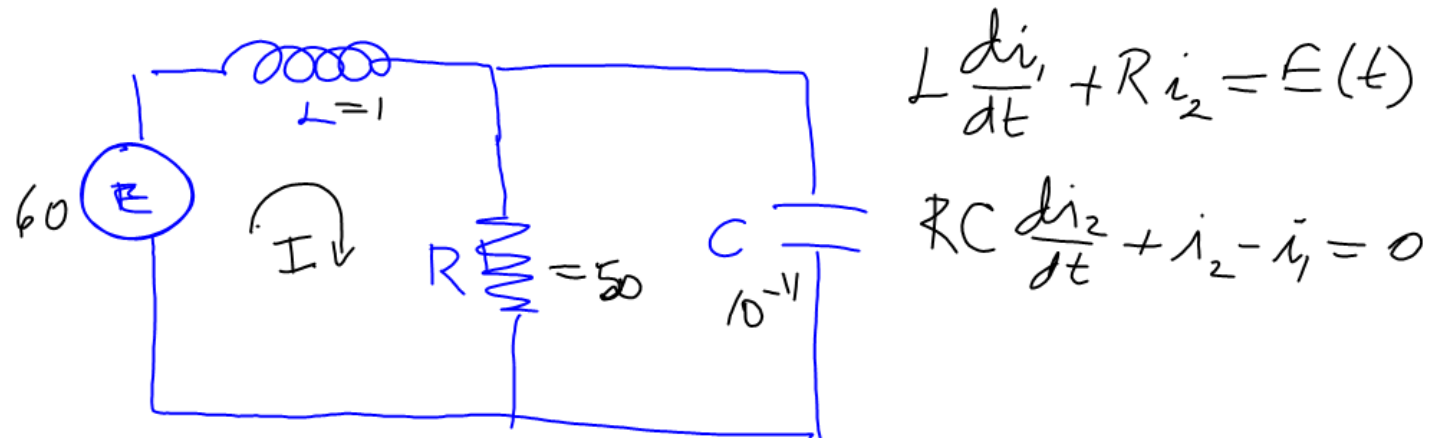


$$x_1(0) = \frac{k_1}{k_2} x_2(0) = \frac{6}{4} \left(\frac{1}{10} \right) \Rightarrow \frac{3}{20}$$

$$x_1'(0) = x_3(0) = 0$$

$$x_2(0) = \frac{1}{10} \text{ m}$$

$$x_2'(0) = x_4(0) = 0$$



$$L \frac{di_1}{dt} + R i_2 = E(t)$$

$$RC \frac{di_2}{dt} + i_2 - i_1 = 0$$

$$\frac{di_1(t)}{dt} = -50 i_2 + 60$$

$$50(10^{-11}) \frac{di_2(t)}{dt} = i_1 - i_2 \Rightarrow \frac{di_2(t)}{dt} = \frac{1000}{5} i_1 - \frac{1000}{5} i_2$$

$$\begin{cases} i_1(0) = 0 \\ i_2(0) = 0 \end{cases}$$

$$\frac{d}{dt} \begin{bmatrix} i_1(t) \\ i_2(t) \end{bmatrix} = \begin{bmatrix} 0 & -50 \\ \frac{1000}{5} & -\frac{1000}{5} \end{bmatrix} \begin{bmatrix} i_1 \\ i_2 \end{bmatrix} + \begin{bmatrix} 60 \\ 0 \end{bmatrix}$$

$$\vec{I} = e^{At} \vec{x}(0) + \int_0^t e^{A(t-\tau)} \vec{b}(\tau) d\tau$$