m_1] $\Sigma F_1 = m_1 \ddot{x}_1 \overset{m_1 = m}{\Longrightarrow}$

$$m\ddot{x}_1 = F - c_1\dot{x}_1 - k_1 x_1 \underset{k_1 = k}{\overset{c_1 = c}{\Longrightarrow}}$$

$$m\ddot{x}_1 = F - c\dot{x}_1 - kx_1 \Rightarrow$$

$$\ddot{x}_1 = \frac{F}{m} - \frac{c}{m}\dot{x}_1 - \frac{k}{m}x_1 \Rightarrow \begin{Bmatrix} x_1 = x(0) \\ \dot{x}_1 = x(1) \end{Bmatrix}$$

$$\ddot{x}_1 = \frac{F}{m} - \frac{c}{m}x(1) - \frac{k}{m}x(0) \quad (1)$$

where $F = c(\dot{x}_2 - \dot{x}_1) + k(x_2 - x_1) \Rightarrow \begin{Bmatrix} x_2 = x(2) \\ \dot{x}_2 = x(3) \end{Bmatrix}$

$$F = c\big(x(3) - x(1)\big) + k\big(x(2) - x(0)\big) \quad (2)$$

$$(1) \overset{(2)}{\Longrightarrow} \ddot{x}_1 = \frac{c}{m}\big(x(3) - x(1)\big) + \frac{k}{m}\big(x(2) - x(0)\big) - \frac{c}{m}x(1) - \frac{k}{m}x(0)$$

$$\Rightarrow \ddot{x}_1 = -\frac{2k}{m}x(0) - \frac{2c}{m}x(1) + \frac{k}{m}x(2) + \frac{c}{m}x(3) \quad (3)$$

m_2] $\Sigma F_2 = m_2 \ddot{x}_2 \overset{m_2 = m}{\Longrightarrow}$

$$m\ddot{x}_2 = F_{external} - c(\dot{x}_2 - \dot{x}_1) - k(x_2 - x_1) \Rightarrow$$

$$m\ddot{x}_2 = F_{external} - c\big(x(3) - x(1)\big) - k\big(x(2) - x(0)\big) \Rightarrow$$

$$\ddot{x}_2 = \frac{F_{external}}{m} + \frac{k}{m}x(0) + \frac{c}{m}x(1) - \frac{k}{m}x(2) - \frac{c}{m}x(3) \quad (4)$$

③,④:

$$\underbrace{\begin{bmatrix} \dot{x}_1 \\ \ddot{x}_1 \\ \dot{x}_2 \\ \ddot{x}_2 \end{bmatrix}}_{\dot{x}} = \underbrace{\begin{bmatrix} 0 & 1 & 0 & 0 \\ -\frac{2k}{m} & -\frac{2c}{m} & \frac{k}{m} & \frac{c}{m} \\ 0 & 0 & 0 & 1 \\ \frac{k}{m} & \frac{c}{m} & -\frac{k}{m} & -\frac{c}{m} \end{bmatrix}}_{A} \cdot \underbrace{\begin{bmatrix} x_1 \\ \dot{x}_1 \\ x_2 \\ \dot{x}_2 \end{bmatrix}}_{x} + \underbrace{\begin{bmatrix} 0 \\ 0 \\ 0 \\ 1/m \end{bmatrix}}_{B} \cdot \underbrace{F_{external}}_{u}$$

$$y = \underbrace{\begin{bmatrix} 1 & 0 & 0 & 0 \end{bmatrix}}_{C} x \quad , \quad D = 0$$