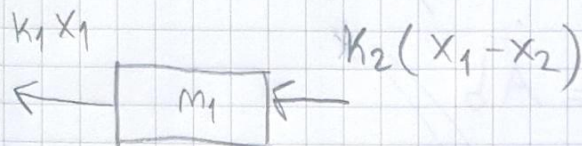


EoM 1

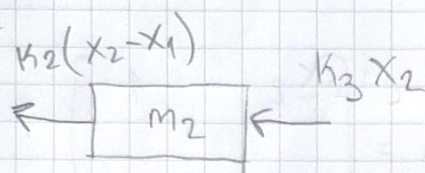


F=ma

$$-k_1 x_1 - k_2 x_1 + k_2 x_2 = m_1 \ddot{x}_1$$

$$m_1 \ddot{x}_1 + x_1(k_1 + k_2) - k_2 x_2 = 0$$

EoM 2



$$-k_3 x_2 - k_2(x_2 - x_1) = m_2 \ddot{x}_2$$

$$m_2 \ddot{x}_2 + x_2(k_2 + k_3) - k_2 x_1 = 0$$

(b)

write the equations in the form:

$$\ddot{x} = Ax$$

$$\underbrace{\begin{bmatrix} m_1 & 0 \\ 0 & m_2 \end{bmatrix}}_M \underbrace{\begin{bmatrix} \ddot{x}_1 \\ \ddot{x}_2 \end{bmatrix}}_{\ddot{x}} = \underbrace{\begin{bmatrix} -(k_1 + k_2) & k_2 \\ k_2 & -(k_2 + k_3) \end{bmatrix}}_K \underbrace{\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}}_x$$

Simplify

$$\begin{bmatrix} \ddot{x}_1 \\ \ddot{x}_2 \end{bmatrix} = \begin{bmatrix} \frac{-(k_1 + k_2)}{m_1} & \frac{k_2}{m_1} \\ \frac{k_2}{m_2} & \frac{-(k_2 + k_3)}{m_2} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

$$\ddot{x} = A \cdot x$$



c)

$$X = b e^{j\omega t}$$

$$\ddot{X} = -\omega^2 b e^{j\omega t}$$

$$-\omega^2 b e^{j\omega t} = A \cdot b e^{j\omega t}$$

$$-\omega^2 = \bar{A} \quad \text{then,}$$

$$\bar{A} b = A b //$$

d)  $k_1 = 1$

$m_1 = m_2 = 1$

Then,

$k_2 = 1$

$k_3 = 1$

$$A = \begin{bmatrix} -2 & 1 \\ 1 & -2 \end{bmatrix}$$