RO2102: Dynamics and Simulation

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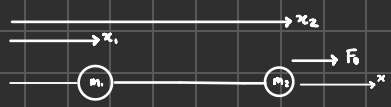
Homework-7

Problem 21 **Due** : 22-Mar-2025 **Time Spent** : 2 Hours

Sketch:



To Find: (a) Comparison to Problem 20 (c)

(b) Find Accuracy

Given: k, l_0, m_1, m_2

$F(t) = F_0 \sin(\omega t)$

$x_1(0) = 0$, $x_2(0) = l_0$

(a) Apply LMB,

$$\sum \vec{F}_{ext} = m\vec{a} \cdot \hat{i}$$

$$\Rightarrow T = m_1 \ddot{x}_1 \quad \text{——— (1)}$$

FBD: mass m_1

FBD: mass m_2

Apply LMB on m_2,

$$\sum \vec{F}_{ext} = m\vec{a} \cdot \hat{i}$$

$$\Rightarrow F - T = m_2 \ddot{x}_2 \quad \text{——— (2)}$$

From constraint,

$$x_2 = x_1 + l_0$$

$$\Rightarrow \ddot{x}_2 = \ddot{x}_1$$

$$\begin{bmatrix} m_1 & 0 & -1 \\ 0 & m_2 & 1 \\ 1 & -1 & 0 \end{bmatrix} \begin{bmatrix} \ddot{x}_1 \\ \ddot{x}_2 \\ T \end{bmatrix} = \begin{bmatrix} 0 \\ F \\ 0 \end{bmatrix}$$