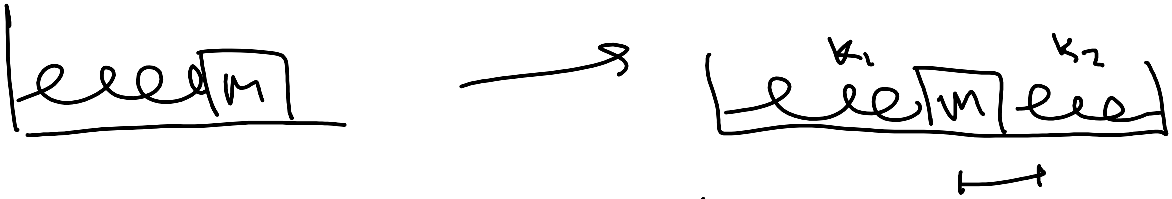
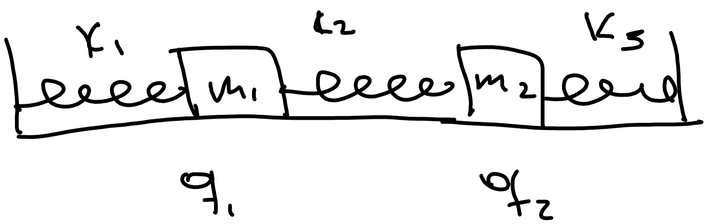
Osciladores Acoplados



$$\boxed{\underbrace{F = -k_1 x - k_2 x}}$$



$$T = \frac{1}{2} m_1 \dot{q}_1^2 + \frac{1}{2} m_2 \dot{q}_2^2$$

$$V = \frac{1}{2} k_1 q_1^2 + \frac{1}{2} k_3 q_2^2 + \frac{1}{2} k_2 (q_1 - q_2)^2$$

$$L = \frac{1}{2} m_1 \dot{q}_1^2 + \frac{1}{2} m_2 \dot{q}_2^2 - \frac{1}{2}(k_1 + k_2) q_1^2 - \frac{1}{2}(k_2 + k_3) q_2^2 \boxed{+ k_2 q_1 q_2}$$

t. acoplamiento.

$$\left.\begin{aligned} m_1 \ddot{q}_1 + (k_1 + k_2) q_1 - k_2 q_2 &= 0 \\ m_2 \ddot{q}_2 + (k_2 + k_3) q_2 - k_2 q_1 &= 0 \end{aligned}\right\}$$

$k_1 = k_2 = k_3 = 2 \quad , m_1 = m_2 = 2$

$$\begin{pmatrix} \ddot{q}_1 \\ \ddot{q}_2 \end{pmatrix} + \begin{pmatrix} 2 & -1 \\ -1 & 2 \end{pmatrix} \begin{pmatrix} q_1 \\ q_2 \end{pmatrix} = 0$$

$$\left.\begin{aligned} q_1 &= -Q_1 + Q_2 \\ q_2 &= Q_1 + Q_2 \end{aligned}\right. \quad (1)$$

$$L_Q = 2\dot{Q}_1^2 + 2\dot{Q}_2^2 - 6Q_1^2 - 2Q_2^2$$

$$\left\{\begin{aligned} &\ddot{Q}_1 + \overset{\omega_1}{3} Q_1 = 0 \\ &\ddot{Q}_2 + \underset{\omega_2}{1} Q_2 = 0 \end{aligned}\right.$$

$$\left.\begin{aligned} \omega_1 &= \sqrt{\lambda_1} \\ \omega_2 &= \sqrt{\lambda_2} \end{aligned}\right\} \text{Modos normales.}$$

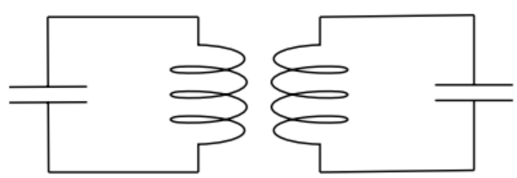
$q_1(t) = -A_1 \operatorname{sen}(\omega_1 t) - B_1 \cos(\omega_1 t) + A_2 \operatorname{sen}(\omega_2 t) + B_2 \cos(\omega_2 t)$

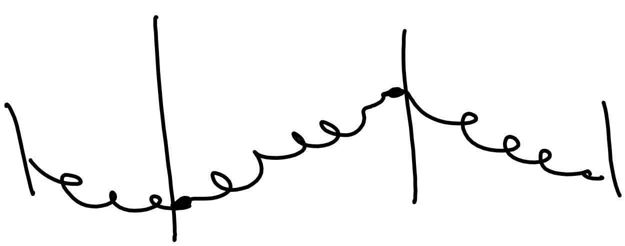
$q_2(t) = + \quad ✓ \quad + \quad ✓ \quad ✓ \quad ✓$

$\dot{q}_1(0) = \dot{q}_2(0) = 0$

$q_1(0) = X_1 \quad ; \quad q_2(0) = X_2$

$$\begin{cases} q_1(t) = X_1 \cos\frac{(\omega_1+\omega_2)t}{2} \cos\frac{(\omega_1-\omega_2)t}{2} + X_2 \sin\frac{(\omega_1+\omega_2)t}{2} \sin\frac{(\omega_2-\omega_1)t}{2} \\ q_2(t) = X_1 \sin\frac{(\omega_1+\omega_2)t}{2} \sin\frac{(\omega_2-\omega_1)t}{2} + X_2 \cos\frac{(\omega_1+\omega_2)t}{2} \cos\frac{(\omega_1-\omega_2)t}{2} \end{cases}$$





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