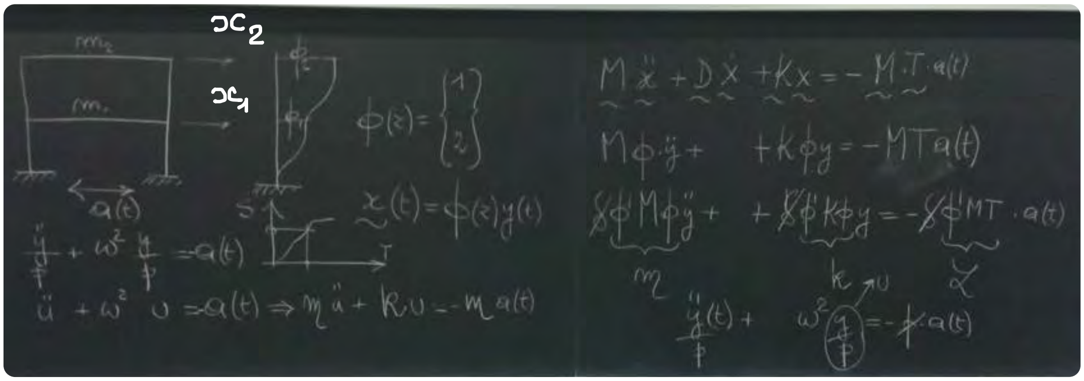
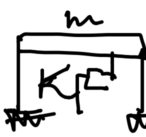
COORDINATE GENERALIZZATE

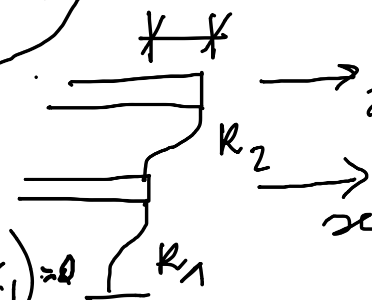


$m(a(t) + \ddot{x}(t)) + d\dot{x} + Kx = 0$ $\rightarrow$ osc_sempl.



$m\ddot{x} + d\dot{x} + kx = -m \cdot a(t)$

eq. delle masse m_1 ed m_2



$$\begin{cases} m_2(a(t) + \ddot{x}_2) + K_2(x_2 - x_1) = 0 \\ m_1(a(t) + \ddot{x}_1) + K_1 x_1 - K_2(x_2 - x_1) = 0 \end{cases}$$

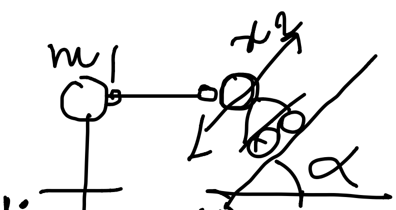
$$\begin{cases} m_1 \ddot{x}_1 + k_1 x_1 - k_2(x_2 - x_1) = -m_1 a(t) \\ m_2 \ddot{x}_2 + k_2(x_2 - x_1) = -m_2 a(t) \end{cases}$$

$$\underset{\sim}{x} = \begin{Bmatrix} x_1 \\ x_2 \end{Bmatrix} \quad M = \begin{vmatrix} m_1 & 0 \\ 0 & m_2 \end{vmatrix} \quad K = \begin{vmatrix} K_{11} & K_{12} \\ K_{21} & K_{22} \end{vmatrix}$$

$$\begin{vmatrix} m_1 & 0 \\ 0 & m_2 \end{vmatrix} \begin{Bmatrix} \ddot{x}_1 \\ \ddot{x}_2 \end{Bmatrix} + \begin{vmatrix} K_{11} & K_{12} \\ K_{21} & K_{22} \end{vmatrix} \begin{Bmatrix} x_1 \\ x_2 \end{Bmatrix} =$$

$$\begin{vmatrix} m_1 & 0 \\ 0 & m_2 \end{vmatrix} \begin{Bmatrix} a(t) \\ a(t) \end{Bmatrix} \rightarrow \begin{Bmatrix} 1 \\ 1 \end{Bmatrix} a(t)$$

$$\begin{vmatrix} m_1 & 0 \\ 0 & m_2 \end{vmatrix} \begin{Bmatrix} 1 \\ 1 \end{Bmatrix} a(t)$$



$$\ddot{x}_2 + a(t)\cos\alpha$$

$$\begin{matrix} k_{11}x_1 + k_{12}x_2 \\ k_{21}x_1 + K_{22}x_2 \end{matrix} = \begin{cases} k_1 x_1 + k_2 x_1 - k_2 x_2 \\ -k_2 x_1 + k_2 x_2 \end{cases}$$

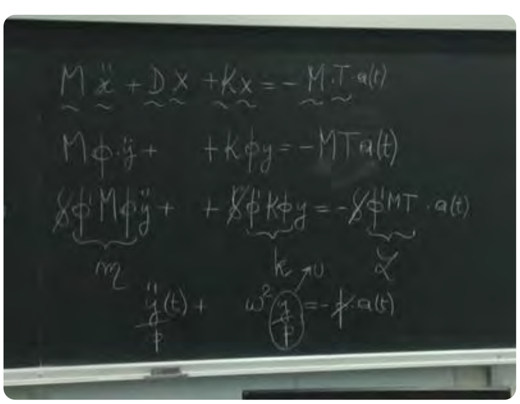
$$k_{11} = k_1 + k_2 \qquad K_{12} = -k_2$$

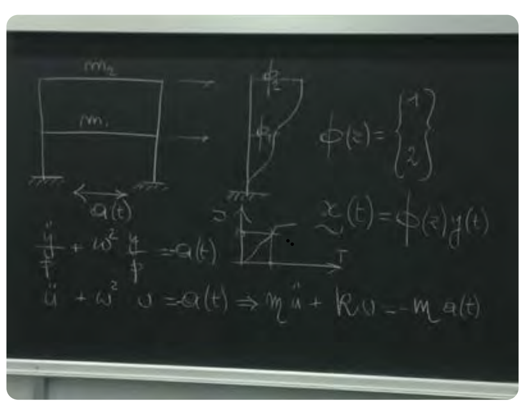
$$K_{21} = -k_2 \qquad k_{22} = K_2$$

$$K = \begin{vmatrix} K_1 + K_2 & -K_2 \\ -k_2 & K_2 \end{vmatrix}$$

$$\underset{\sim}{M}\ddot{\underset{\sim}{x}} + \underset{\sim}{K}\underset{\sim}{x} = -\underset{\sim}{M}\underset{\sim}{I}\,a(t)$$

$$\underset{\sim}{x} = \begin{Bmatrix} \phi_1 \\ \phi_2 \end{Bmatrix} y(t) \qquad \begin{Bmatrix} 1 \\ 2 \end{Bmatrix} y(t) \qquad \begin{Bmatrix} 0{,}5 \\ 1 \end{Bmatrix} y_1$$





$\delta_y \phi^T (\quad) =$

$$M\phi\ddot{y} + K\phi y = -MT\,a(t)$$

$$\begin{Bmatrix}\phi_1\\ \phi_2\end{Bmatrix} \quad \delta_g = \phi\,\delta_y$$

$$\phi^T = (\phi_1\ \phi_2)$$

$$\underbrace{\delta_y \phi^T M \phi}_{m} \ddot{y} + \delta_y \underbrace{\phi^T K \phi}_{k} y = -\delta_y \underbrace{\phi^T M T}_{\mathcal{L}} a(t)$$

$$\phi^T \begin{Bmatrix} F_1 \\ F_2 \end{Bmatrix} = K\phi$$

$$\overbrace{M\phi}^{2\times 1 \ \ 2\times 1}$$

$$\phi^T M \phi$$

$$\underset{1\times 2}{}\ \underbrace{\underset{2\times 2}{}\ \underset{2\times 1}{}}_{2\times 1} = m$$

$$m_L = \phi^T M \phi$$

$$k = \phi^T K \phi$$

$$\mathcal{L} = \phi^T M T$$

$$m_L\, \ddot{y}/\cancel{\mathcal{L}} + k\, y/\cancel{\mathcal{L}} = a(t)$$

$$m\ddot{y} + ky = \mathcal{L}\, a(t)$$

$$m\ddot{x} + kx = m\,a(t) \qquad \text{osc. semplice}$$

$$\ddot{y} + \frac{k}{m} y = -\frac{\mathcal{L}}{m} a(t) \qquad \frac{\mathcal{L}}{m} = \phi$$

$$m\,\ddot{y}/\phi + k\,y/\phi = -m\,a(t)$$

$$\frac{\ddot{y}}{\phi} + \frac{k}{m}\frac{y}{\phi} = a(t) \quad \leftarrow \text{pseudo osc semplice}$$

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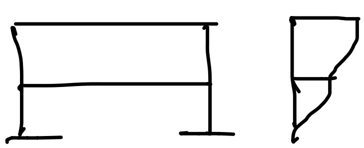
$$\ddot{x} + \frac{k}{m} x = a(t) \qquad \text{osc. semplice}$$

$$y/\phi = U$$

$$\ddot{U} + \frac{k}{m} U = a(t) \ ; \quad \frac{k}{m} = \omega^2$$



$$x = \phi\, y \qquad u(t=0) = U_0$$