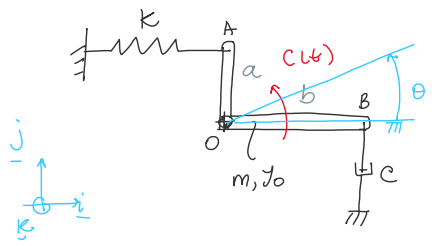
# Esercizio: oscillazioni libere smorzate

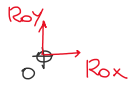
venerdì 13 dicembre 2024 11:33




Noto: $a, b$; $k, c$; $m, J_0$; $C(t) = C_0 \cos(\omega t)$ ⇒ Hp piccole oscillazioni

Valutare: •) L'eq^ne moto •) $\omega_n, \xi$

⇒ n° gdl = 3 − 2 (CERNIERA) = 1 ⇒ 1 COORDINATA ⇒ $\theta$

⇒ AFV: 

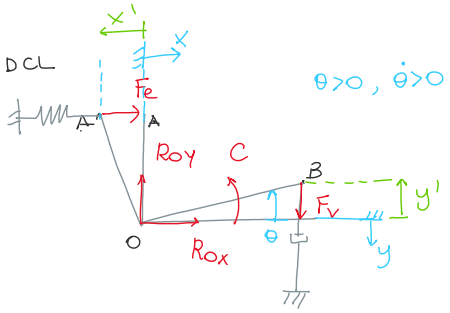
⇒ (2) INCOGN.

FORZE/COPPIE ATTIVE ⇒ $\underline{C}(t) = C_0 \cos(\omega t)\,\underline{k}$ ⇒ nota

INCOGNITA ACCEL ⇒ $\ddot{\theta} \rightarrow \dot{\theta}, \theta$

(1) 2+1 = 3 INCOGNITE ⇒ { I CD. < X, Y ; II CD } 3 EQ^NI

⇒ DCL




$\theta > 0, \dot{\theta} > 0$

$\theta > 0 \Rightarrow x < 0,\ y < 0$

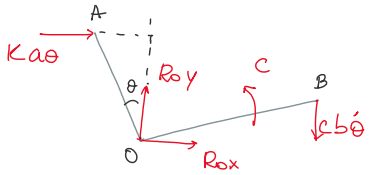
se $\theta$ è piccolo $\sin\theta \simeq \theta$ (=)

$$\begin{cases} x = -a\theta \\ y = -b\theta \end{cases}$$

$\theta > 0 \Rightarrow x' > 0,\ y' > 0$

$$\begin{cases} x' = a\theta \\ y' = b\theta \end{cases}$$

"O" è FISSO




⇒ IICD $\quad -ka\theta\, a\cos\theta - cb\dot{\theta}\, b\cos\theta + C_0\cos(\omega t) = J_0\ddot{\theta}$

$$J_0\ddot{\theta} + cb^2\dot{\theta} + ka^2\theta = C_0\cos(\omega t)$$

$$\omega_n = \sqrt{\frac{k_{eq}}{J_{eq}}} = \sqrt{\frac{ka^2}{J_0}}$$

$$\xi = \frac{c_{eq}}{2J_{eq}\omega_n} = \frac{cb^2}{2J_0\sqrt{ka^2/J_0}}$$

CONDIZIONE RISONANZA ⇒ $\Omega = \omega_n$