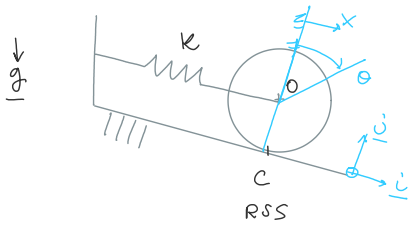
Esercizio: oscillazioni libere

venerdì 13 dicembre 2024 12:04

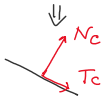


Noto
⇒ disco omogeneo $G \equiv O$, m, J_G
r
K

Valutare
1) Eq^re moto
2) ω_n

⇒ disco RSS ⇒ "O" trasla lungo $\vec{\imath}$

⇒ AFV ⇒ RSS $-$ 2 gdl ⇒ disco 1 gdl ⇒ $x = r\theta$, $\dot{x} = r\dot{\theta}$, $\ddot{x} = r\ddot{\theta}$



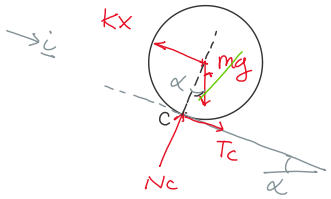
$T_C \le f_s N_C$

⇓

2 INCOGNITE REATTIVE + 1 INC. $\ddot{\theta}$ ⇒ 3 INCOG ⟷ 3 Eq^ni EQUILIBRIO

⇒ $X = 0$ dalle condiz. di equil. STATICO

DCL

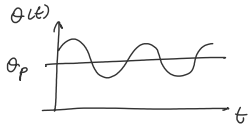


IICD C) $-Kx r + mg \sin\alpha\, r = J_C \ddot{\theta}$

$(J_o + mr^2)\ddot{\theta} + Kr^2\theta = mgr\sin\alpha$

FORZANTE COSTANTE

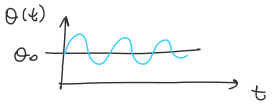
$\theta(t) = \theta_{om}(t) + \theta_p$, $\theta_p(t) = \theta_0$



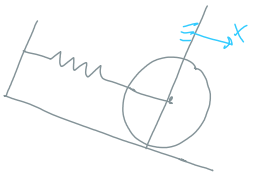
$x_0 = r\theta_0$ ⟷ θ_0 ⇒ $\dot{\theta}_p(t) = 0$, $\ddot{\theta}_p(t) = 0$

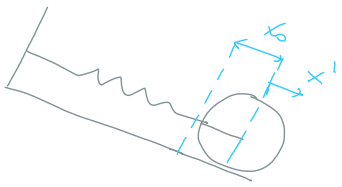
$Kr^2\theta_0 = mg \sin\alpha$

$\theta_0 = \dfrac{mg\sin\alpha}{Kr}$ ⇒ FRECCIA STATICA ⟷ $x_0 = r\theta_0$ ALLUNGAM. MOLLA PER EFFETTO FORZA PESO



x' t.c. $x' = 0$ quando $x = x_0 = r\theta_0$





$x = x' + x_0$, $\dot{x} = \dot{x}'$, $\ddot{x} = \ddot{x}'$

$r\theta = r\theta' + r\theta_0$, $\theta = \theta' + \theta_0$

$(J_o + mr^2)\ddot{\theta} + Kr^2\theta = mgr\sin\alpha$

$(J_o + mr^2)\ddot{\theta}' + Kr^2(\theta' + \theta_0) = mgr\sin\alpha$

$\theta_0 = \frac{mg\sin\alpha}{kr}$ $\quad (J_o + mr^2)\ddot{\theta}' + kr^2\theta' + kr^2\theta_0 = mgr\sin\alpha$

$\Downarrow$

$\rightarrow \quad \| \; (J_o + mr^2)\ddot{\theta}' + kr^2\theta' = 0 \; \|$