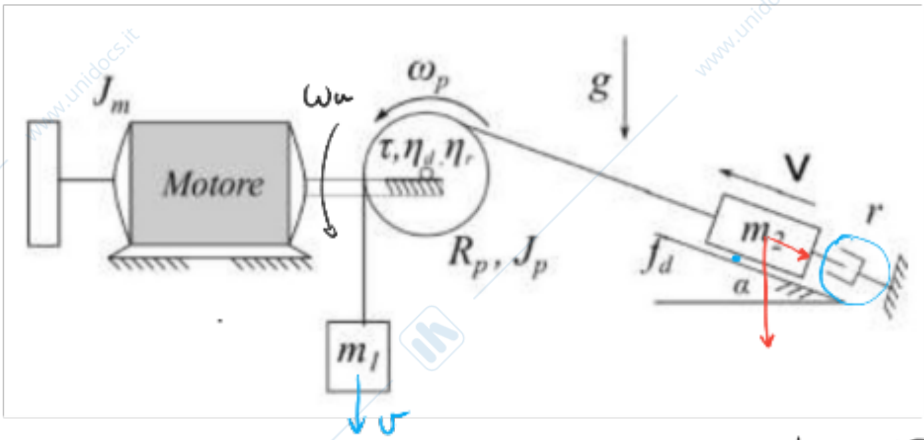
Ese17.2_MTU



$\omega_m = \frac{v}{R_p \tau}$

$\dot\omega_m = \frac{a}{R_p \tau}$

1) $m_2 \uparrow$ $v = V = cost$ $m_{1,lim}$ t.c. moto RETROGRADO

2) $m_1 > m_{1,lim}$ calcolare C_m a regime $v = V$

3) $C_m = 0$, calcolare a di m_2

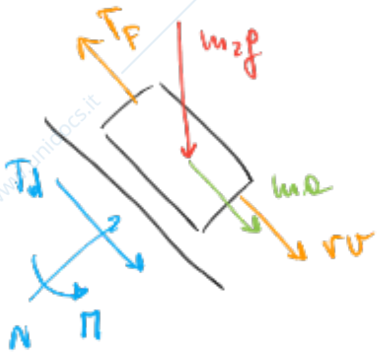
4) $C_m = C_{m0}$, $m_1 > m_{1,lim}$ a di m_2

$$W_m - W_2 = \frac{dE_{cm}}{dt}$$

$$E_{cm} = \frac{1}{2} m_1 v^2 + \frac{1}{2} m_2 v^2 + \frac{1}{2} J_p \omega_p^2$$

$$\frac{dE_{cm}}{dt} = \left(m_1 + m_2 + \frac{J_p}{R_p^2}\right) a v = m_m^* a v$$

$$W_m = m_1 g v - m_2 g \sin\alpha\, v - \underbrace{r \cdot v}_{F_{smorz.}} \cdot v - T_d v$$



$$T_d = f_d N$$

$$\Sigma F_\perp = 0 \qquad N = m_2 g \cos\alpha$$

$$W_2 = W_m - m_m^* a v = \left(m_1 g - m_2 g \sin\alpha - f_d m_2 g \cos\alpha - r v\right) v + - m_m^* a v$$

1) $v = V = cost \rightarrow a = 0$ $m_{1,lim}$ t.c. moto RETROGRADO

$$W_2 = \left(\left(m_1 - m_2 (\sin\alpha + f_d \cos\alpha)\right) g - r V\right) V > 0$$

$$m_1 > m_2 (\sin\alpha + f_d \cos\alpha) + \frac{rV}{g} = m_{1,lim}$$

2) $\overline{C_m}$? $m_1 > m_{1,lim} \longrightarrow$ RETROGRADO

$$W_m + W_u + W_{P_R} = \frac{dE_c}{dt} = 0$$

$$C_m\omega_m + \left[\left(m_1 - m_2(\sin\alpha + f_d\cos\alpha)\right)g - rV\right]V +$$

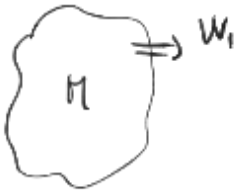
$$-(1-\eta_R)\left[\left(m_1 - m_2(\sin\alpha + f_d\cos\alpha)\right)g - rV\right]V = 0$$

$$C_m\omega_m + \eta_R\left[\left(m_1 - m_2(\sin\alpha + f_d\cos\alpha)\right)g - rV\right]V = 0$$

$$\overline{C_m} = -R\tau\eta_R\underbrace{\left[\left(m_1 - m_2(\sin\alpha + f_d\cos\alpha)\right)g - rV\right]}_{>0} < 0$$

3) $C_m = 0$, a? $m_1 > m_{1,lim}$

$$W_2 = \left[\left(m_1 - m_2(\sin\alpha + f_d\cos\alpha)\right)g - rV\right]V - \underbrace{m_u^* a v}_{>0} \gtrless 0 \ ?$$



$$W_m - W_1 = \frac{dE_{cm}}{dt}$$

$$W_1 = \underbrace{\cancel{W_m}}_{0} - J_m\dot\omega_m\omega_m = -\underbrace{J_m\dot\omega_m\omega_m}_{>0} < 0 \longrightarrow \text{RETROGRADO}$$

$$W_p = W_{P_R} = -(1-\eta_R)W_2$$

$$\underbrace{\cancel{W_m}}_{0} + W_u + W_p = \frac{dE_c}{dt}$$

$$\left[\left(m_1 - m_2(\sin\alpha + f_d\cos\alpha)\right)g - rV\right]V +$$

$$-(1-\eta_R)\left\{\left[\left(m_1 - m_2(\sin\alpha + f_d\cos\alpha)\right)g - rV\right]V - m_u^* a v\right\} =$$

$$= J_m\dot\omega_m\omega_m + m_u^* a v$$

$$\eta_R\left[\left(m_1 - m_2(\sin\alpha + f_d\cos\alpha)\right)g - rV\right]\cancel{V} = \left(\frac{J_m}{R_p^2\tau^2} + \eta_R m_u^*\right)\cancel{v}a$$

$$a = \frac{\eta_R\left[\left(m_1 - m_2(\sin\alpha + f_d\cos\alpha)\right)g - rV\right]}{\frac{J_m}{R_p^2\tau^2} + \eta_R m_u^*} > 0$$

4) $v \simeq 0$ $\quad C_m = C_{m0}$ $\quad m_1 > m_{1,lim}$, a? $\quad$?

$$W_2 = [(m_1 - m_2(\sin\alpha + f_d\cos\alpha))g - rv]v - m^*_u \underset{>0}{a} v \overset{?}{\gtrless} 0$$

$$W_1 = W_m - \frac{dE_{cm}}{dt} = C_{m0}\omega_m - J_m\dot{\omega}_m\omega_m \overset{?}{\gtrless} 0$$

Ipotesi moto DIRETTO

$$W_p = W_{p_D} = -(1-\eta_D)(C_{m0}\omega_m - J_m\dot{\omega}_m\omega_m)$$

$$\frac{\eta_D}{R\tau} C_{m0}\cancel{v} + [(m_1 - m_2(\sin\alpha + f_d\cos\alpha))g - rv]\cancel{v} =$$
$$= \left(m^*_u + \eta_D\frac{J_m}{R^2\tau^2}\right) a \cancel{v}$$

$$a_s = \frac{\frac{\eta_D}{R\tau} C_{m0} + [m_1 - m_2(\sin\alpha + f_d\cos\alpha)]g}{\left(m^*_u + \eta_D\frac{J_m}{R^2\tau^2}\right)}$$

3) B

$$\eta_R[(m_1 - m_2(\sin\alpha + f_d\cos\alpha))g - rV]\cancel{v} = \left(\frac{J_m}{R^2\tau^2} + \eta_R m^*_u\right)\cancel{v} a$$

$$\eta_R[(m_1 - m_2(\sin\alpha + f_d\cos\alpha))g] - \eta_R r v = m^*_{TOT,R}\, a$$

$m^*_{TOT,R}\,\dot{v} + \eta_R r v = F_0$ $\quad$ Eq diff lineare a coeff costanti del 1° ordine

$$v(t) = v_p(t) + v_{OA}(t)$$

$v_p = V_p = cost$ $\quad \eta_R r V_p = F_0$ $\quad \dot{v}_p = 0$

$$V_p = \frac{F_0}{\eta_R r}$$

$v_{OA} = V_0 e^{\lambda t}$ $\quad \dot{v}_{OA} = \lambda V_0 e^{\lambda t}$

$$m^*_{TOT,R}\,\lambda V_0 e^{\lambda t} + \eta_R r V_0 e^{\lambda t} = 0$$

$$(m^*_{TOT,R}\,\lambda + \eta_R r)V_0 e^{\lambda t} = 0$$

$e^{\lambda t} \neq 0 \ \forall t$

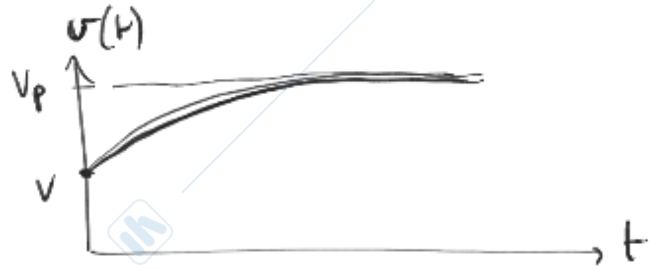
$V_0 = 0$ sol banale

$$\lambda = -\frac{\eta_R r}{m^*_{TOT,R}} = -\frac{1}{T}$$

$$v(t) = V_p + V_0 e^{-t/T}$$

$v(t) = v_p + v_0 e$

$v(t=0) = V \qquad V_0 = V - V_p$



Ultima modifica: 11:40