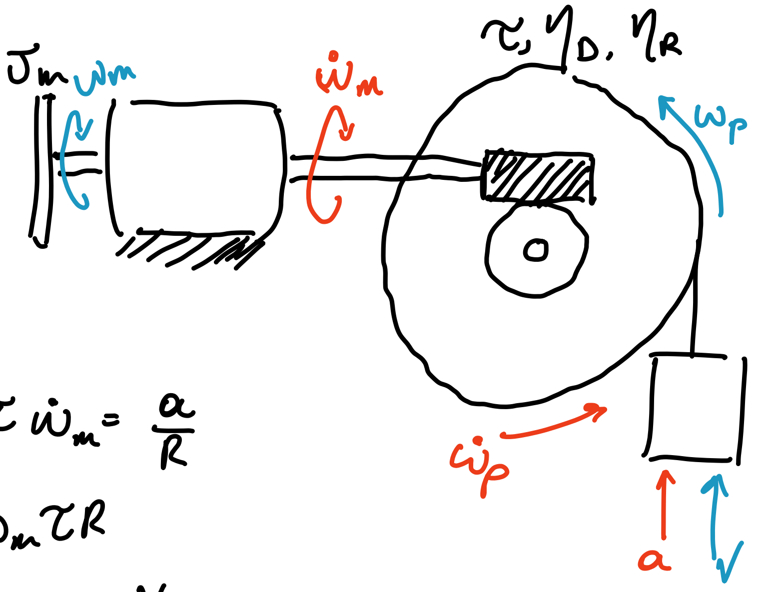
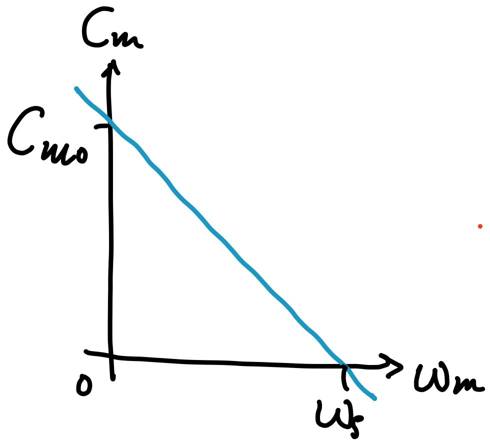
Oratorio 7 -



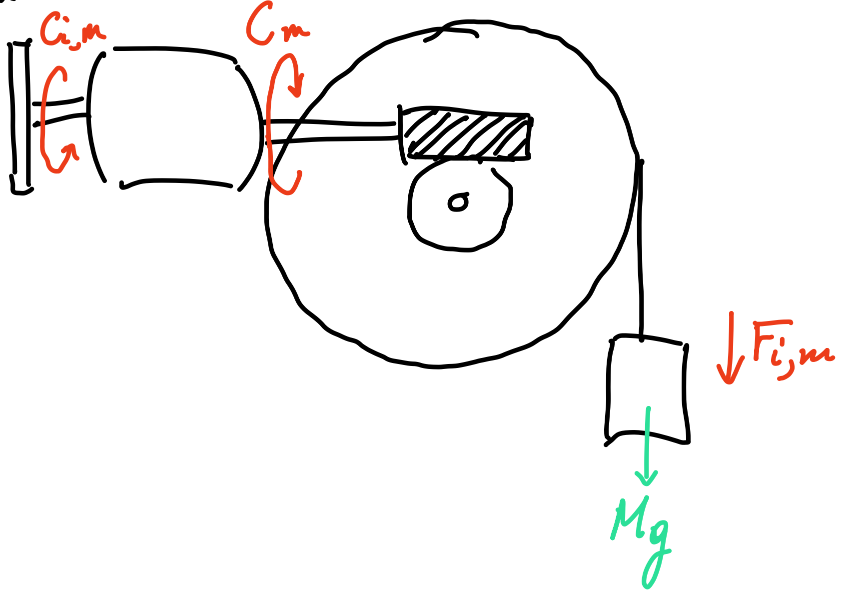


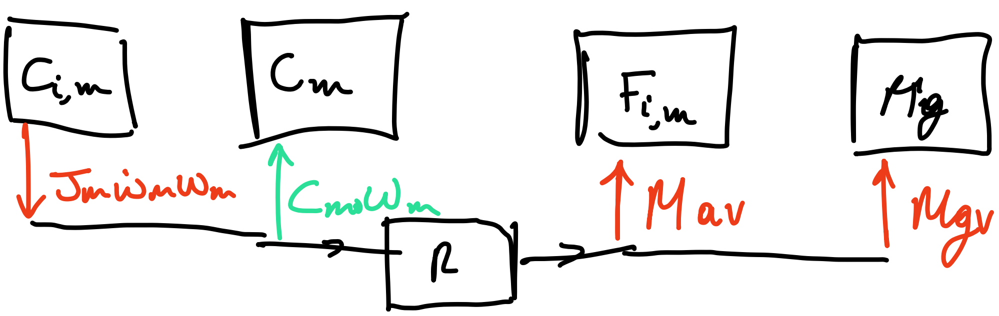
$$\dot{\omega}_p = \tau \dot{\omega}_m = \frac{a}{R}$$

$$a = \dot{\omega}_m \tau R$$

$$\omega_p = \tau \omega_m = \frac{v}{R}$$

$$v = \tau \omega_m R$$





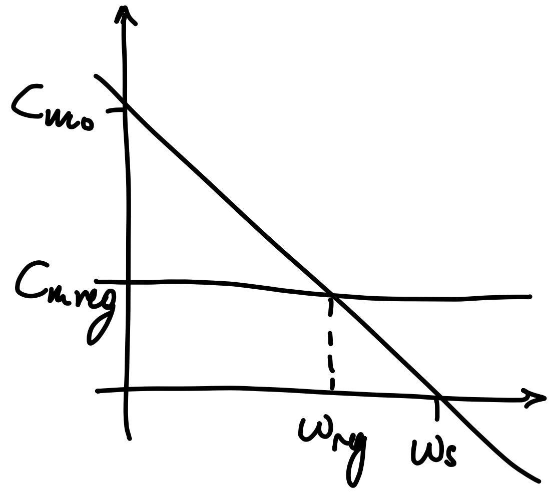
$$(C_m \omega_m - J_m \dot{\omega}_m \omega_m)\eta_D - (Mav + Mgv) = 0$$

$$C_m \omega_m \eta_D - J\dot{\omega}_m \omega_m \eta_D - M\dot{\omega}_m \omega_m (\tau R)^2 - Mg\omega_m(\tau R) = 0$$

$$C_m \omega_m \eta_D - Mg\omega_m(\tau R) = J_m \dot{\omega}_m \omega_m \eta_D + M\dot{\omega}_m \omega_m (\tau R)^2$$

$$\frac{C_m \cancel{\omega_m} \eta_D - Mg\cancel{\omega_m}(\tau R)}{J_m \cancel{\omega_m} \eta_D + M\cancel{\omega_m}(\tau R)^2} = \dot{\omega}_m$$

A regime $a = 0 \Rightarrow \dot{\omega}_m = 0$



$$C_m^{(\omega_{reg})} \omega_m \eta_D - Mg\omega_m(\tau R) = 0$$

$$\cancel{\omega_m}\left(C_m \eta_D - Mg\tau R\right) = 0$$

$$C_m(\omega_{reg}) = \frac{Mg\tau R}{\eta_D}$$

$$\omega_s = \frac{2\pi n_s}{60} = 78{,}54\ \frac{rad}{s}$$

$$C_m(\omega_{reg}) = C_{mo}\left(1 - \frac{\omega_{reg}}{\omega_s}\right)$$

$$\frac{C_m(\omega_{reg})}{C_{mo}} = 1 - \frac{\omega_{reg}}{\omega_s}$$

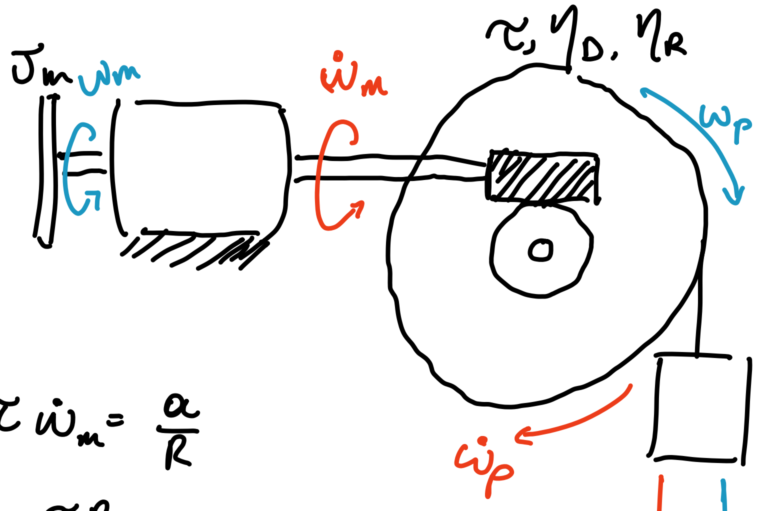
$$\omega_{reg} = \omega_s\left(1 - \frac{C_{mreg}}{C_{mo}}\right) = 30{,}38\ \frac{rad}{s}$$

$$= \omega_s \left(1 - \frac{Mg\tau R}{\eta_D C_0} \right)$$

$$C_m \omega_m \eta_D - J\dot{\omega}_m \omega_m \eta_D - M\dot{\omega}_m \omega_m (\tau R)^2 - Mg\omega_m (\tau R) = 0$$

$$C_m \omega_m \cancel{\eta_D} - \frac{Mg\omega_m (\tau R)}{\eta_D} = \underbrace{\frac{M\dot{\omega}_m \cancel{\omega_m} (\tau R)^2}{\eta_D} + J\dot{\omega}_m \cancel{\omega_m} \cancel{\eta_D}}_{J_T^{Rid} \cdot \dot{\omega}_m}$$

4)

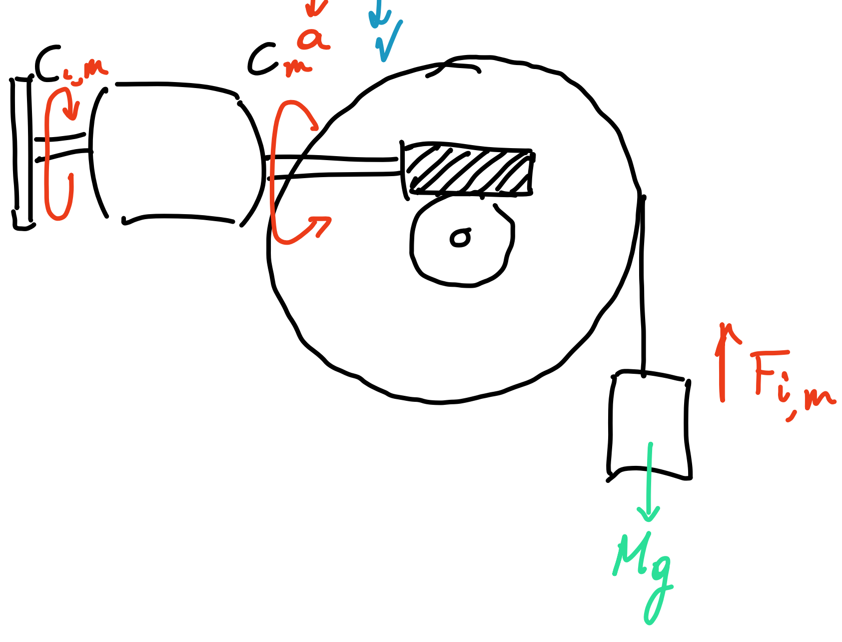


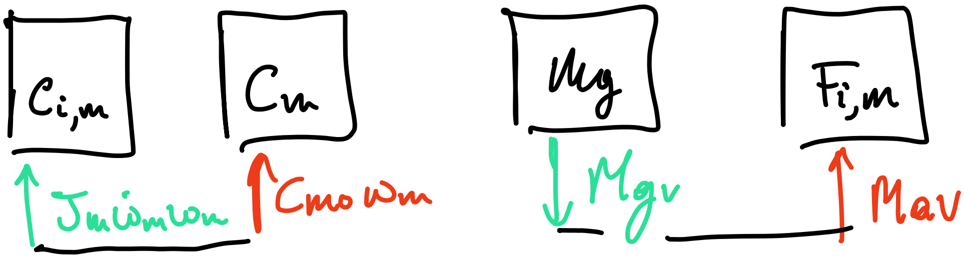
$$\dot{\omega}_p = \tau \dot{\omega}_m = \frac{a}{R}$$

$$a = \dot{\omega}_m \tau R$$

$$\omega_p = \tau \omega_m = \frac{v}{R}$$

$$v = \tau \omega_m R$$





se>0 retrograde
se<0 diretto

se<0 a>g per ipotesi diretto

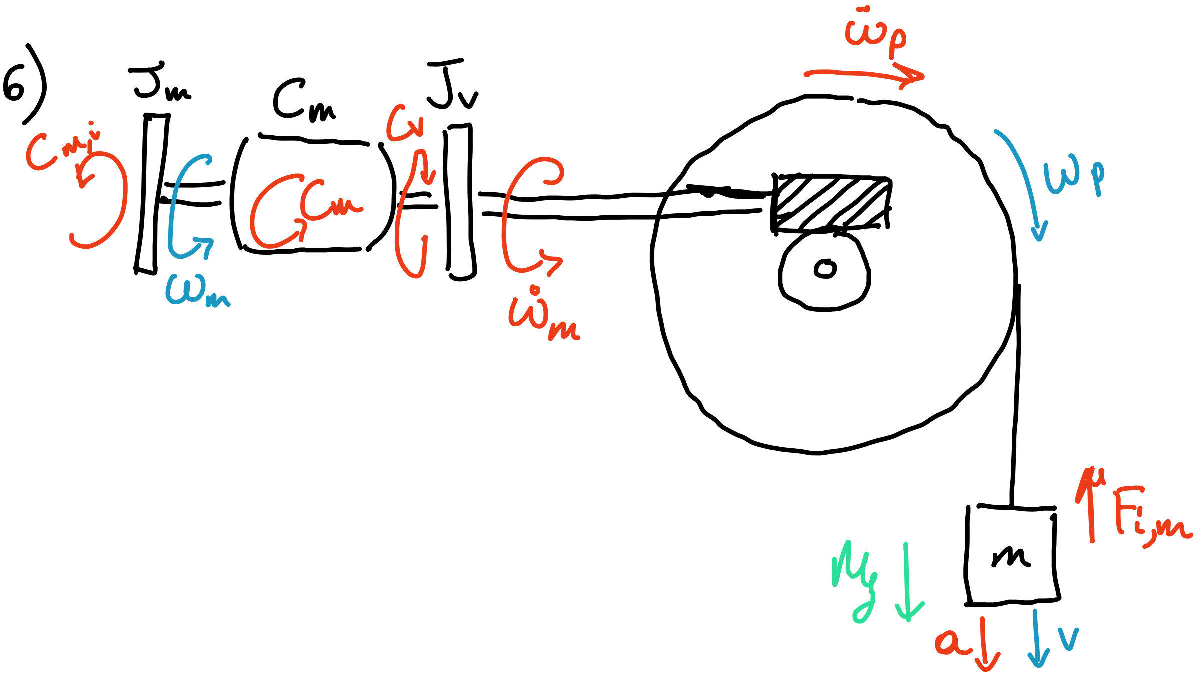
$$(-J_m\dot{\omega}_m\omega_m + C_{mo}\omega_m)\eta_D + Mgv - Mav = 0$$

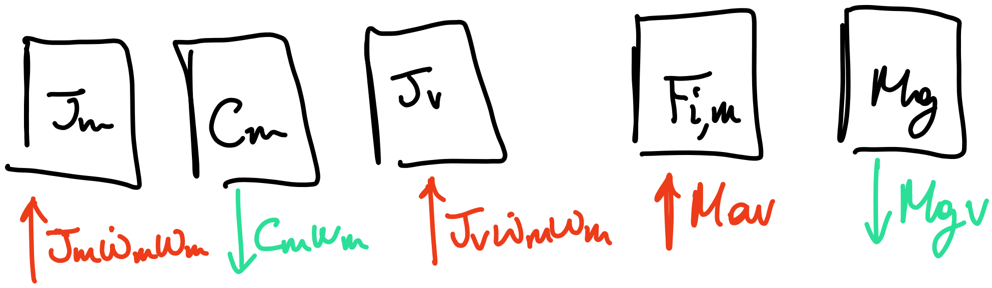
$$J_m\dot{\omega}_m\cancel{\omega_m}\eta_D - C_{mo}\cancel{\omega_m}\eta_D + Mg\cancel{\omega_m}\tau R - M\dot{\omega}_m\cancel{\omega_m}(\tau R)^2 = 0$$

$$\dot{\omega}_m = \frac{Mg\tau R + C_{mo}\eta_D}{M(\tau R)^2 + J_m\eta_D} = \frac{51,62}{0,016} = 3226\ \frac{rad}{s^2}$$

$$a = 12,905\ \frac{m}{s^2}$$

6)





Ipotesi retrogrado perché $g > a$

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

$$C_m \cancel{\omega_m} - J_m\dot\omega_m \cancel{\omega_m} - J_v\dot\omega_m\cancel{\omega_m} + Mg\cancel{\omega_m}\tau R\eta_R - M\dot\omega_m\cancel{\omega_m}(\tau R)^2\eta_R$$

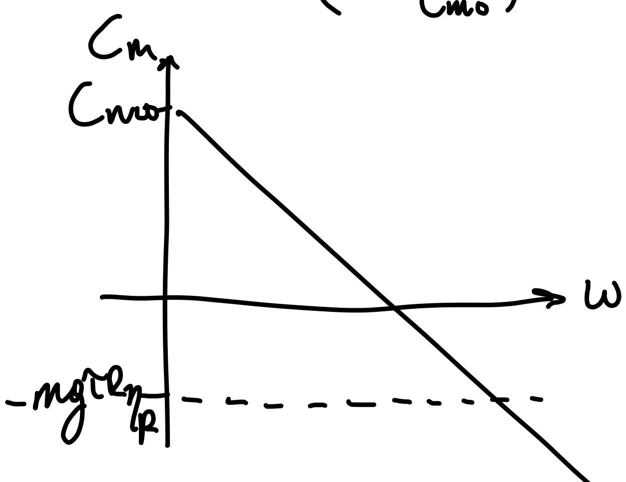
$$J_v = 0{,}088\ kgm^2$$

7) $$C_m\cancel{\omega_m} + Mg\cancel{\omega_m}\tau R\eta_R = 0$$

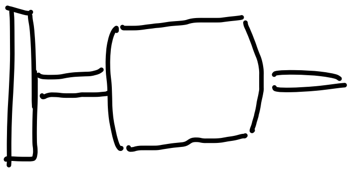
$$C_m = -Mg\tau R\eta_R$$

$$C_{m0}\left(1-\frac{\omega_m}{\omega_s}\right) = C_m$$

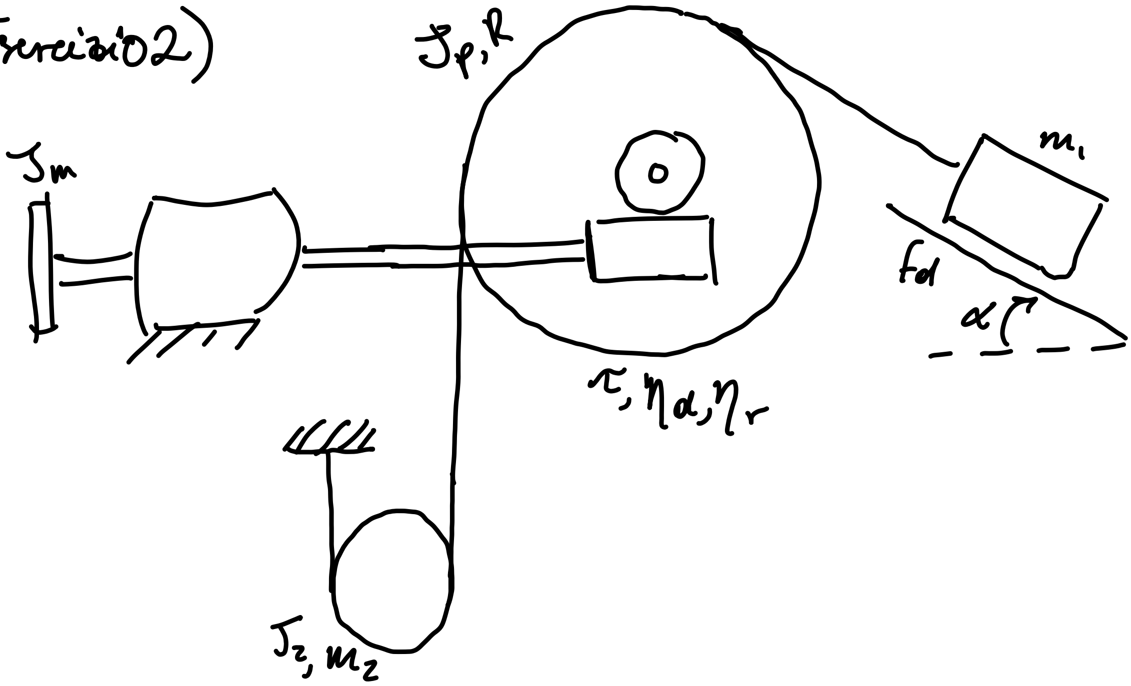
$$\omega_m = \left(1-\frac{C_m}{C_{m0}}\right)\omega_s = 105\ \frac{rad}{s}$$ ✓



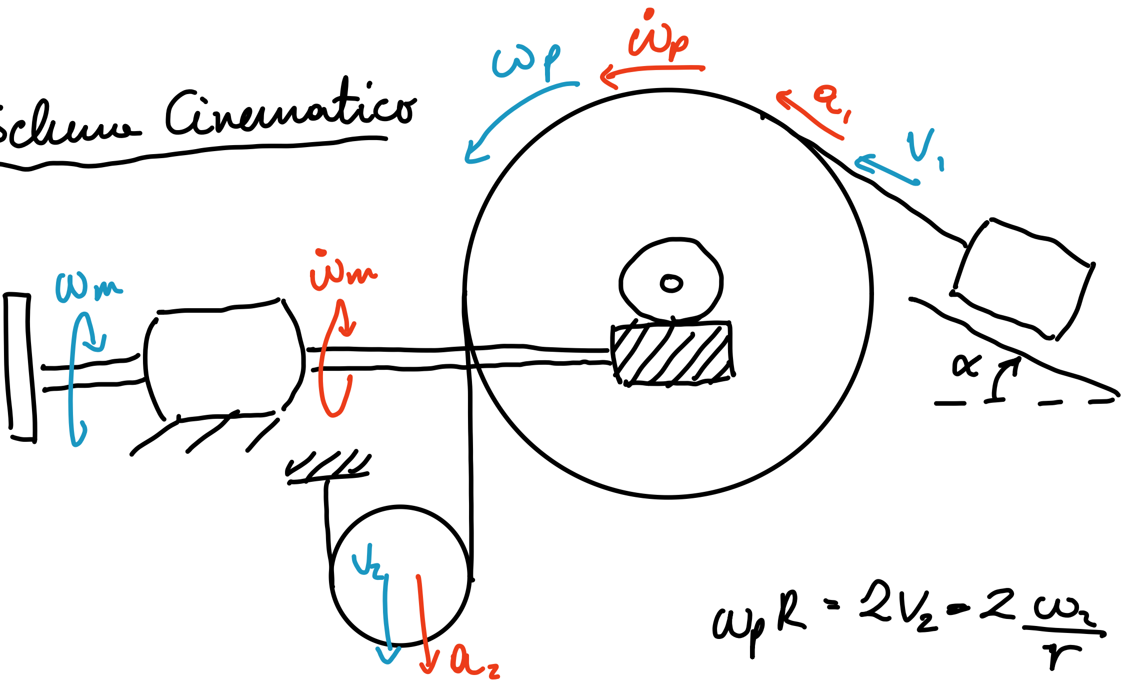
1)



Esercizio 2)



Schema Cinematico



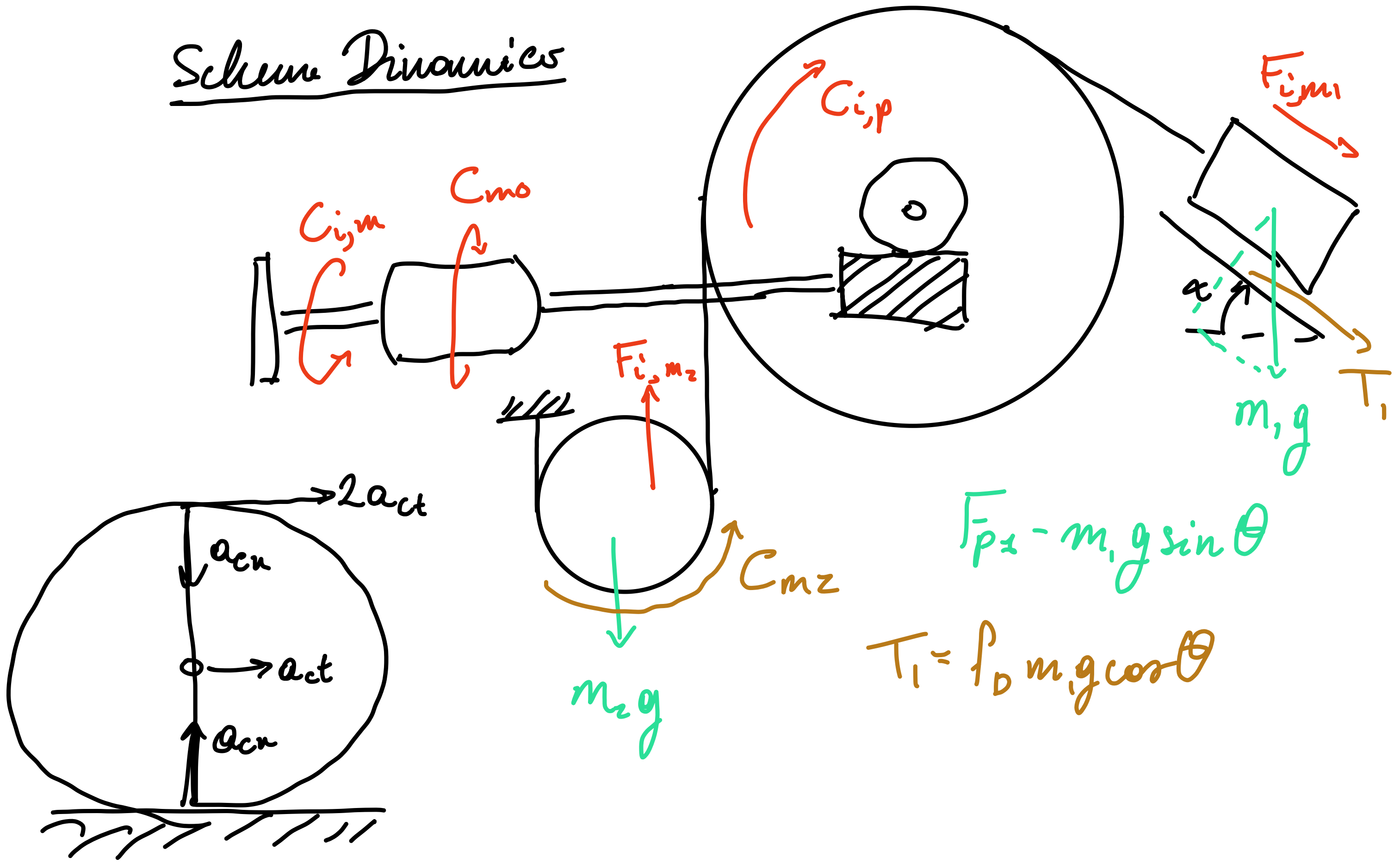
$$\omega_p R = 2V_2 = 2\frac{\omega_2}{r}$$

$$\omega_p = \omega_m \tau = \frac{V_1}{R} = \frac{2V_2}{R}$$

$$\dot{\omega}_p = \dot{\omega}_m \tau = \frac{a_1}{R} = \frac{2a_2}{R}$$

$$\omega_2 = \frac{V_2}{r} \qquad \dot{\omega}_2 = \frac{a_2}{r}$$

Schema Dinamico



C_m	$C_{i,m}$	F_{i,m_2}	$m_2 g$	$C_{i,m2}$	$C_{i,p}$	F_{i,m_1}	T_1	$m_1 g$
↓ $C_m \omega_m$	↑ $J_m \dot\omega_m \omega_m$	↑ $m_2 a_2 v_2$	↓ $m_2 g v_2$	↑ $J_{m2} \dot\omega_2 \omega_2$	↑ $J_p \dot\omega_p \omega_p$	↑ $m_1 a_1 v_1$	↑ $T_1 v_1$	↑ $m_1 g v_1$

se $C_m > J_m \dot\omega_m \Rightarrow$ diretto ipotesi: η_D

$$(C_m \omega_m - J_m \dot\omega_m \omega_m)\eta_D + m_2 g \underset{\frac{\omega_m \tau R}{2}}{v_2} - m_2 \overset{\frac{\dot\omega_m \tau R}{2}}{a_2} v_2 - J_{m2} \overset{\frac{\dot\omega_m \tau R}{2r}}{\dot\omega_2} \underset{\frac{\omega_m \tau R}{r}}{\omega_2} - J_p \overset{\dot\omega_m \tau}{\dot\omega_p} \underset{\omega_m \tau}{\omega_p} - m_1 \overset{\dot\omega_m \tau R}{a_1} \underset{\omega_m \tau R}{v_1} - T_1 v_1 - m_1 g \underset{\omega_m \tau R}{v_1}$$

$$C_m \eta_D - J_m \dot\omega_m \eta_D + \frac{m_2 g \tau R}{2} - \frac{m_2 \dot\omega_m (\tau R)^2}{4} - \frac{J_{m2} \dot\omega_m (\tau R)^2}{2r^2} - J_p \dot\omega_m \tau^2 - m_1 \dot\omega_m (\tau R)^2 - T_1 \tau R - m_1 g \tau R$$

1) $$\dot\omega_m = \frac{C_m \eta_D + \frac{m_2 g \tau R}{2} - T_1 \tau R - m_1 g \tau R \sin\alpha}{J_m \eta_D + \frac{m_2 (\tau R)^2}{4} + \frac{J_{m2} (\tau R)^2}{2r^2} + J_p \tau^2 + m_1 (\tau R)^2} = 6{,}8 \ \frac{rad}{s^2}$$

2) $C_m \eta_D + \frac{m_2 g \tau R}{2} \cdot T_1 \tau R - m_1 g \tau R \sin\alpha = 0$

$$C_m \eta_D + \frac{m_2 g \tau R}{2} - f_D m_1 g \cos\alpha \, \tau R - m_1 g \, \tau R \sin\alpha = 0$$

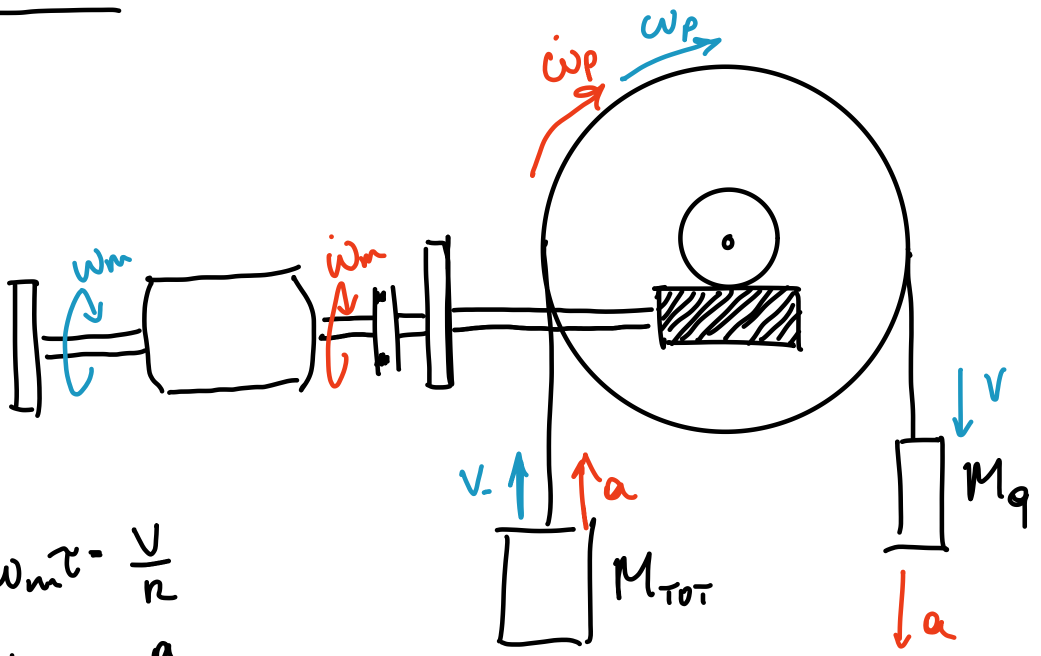
$$C_m = \frac{m_1 g \, \tau R \sin\alpha + f_D m_1 g \cos\alpha \, \tau R}{\eta_D} - \frac{m_2 g \, \tau R}{2 \eta_D}$$

$$= 8{,}175 + 2{,}831 - 10.9 = 10{,}9 \ Nm$$

$$C_m = \left(1 - \frac{\omega_m}{\omega_s}\right) C_{m0}$$

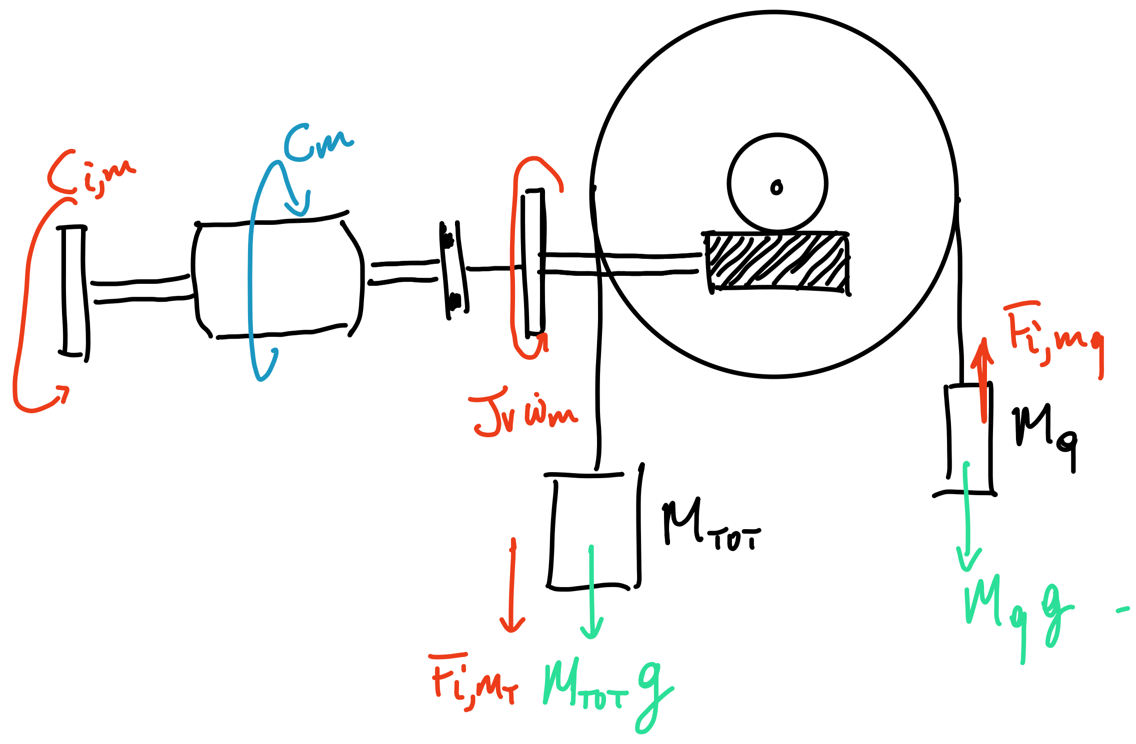
$$\omega_m = \omega_s \left(1 - \frac{C_m}{C_{m0}}\right) = -18{,}125 \ \frac{rad}{s}$$ ← sbagliato

Esercizio 3



$$\omega_p = \omega_m \tau = \frac{V}{R}$$

$$\dot{\omega}_p = \dot{\omega}_m \tau = \frac{a}{R}$$

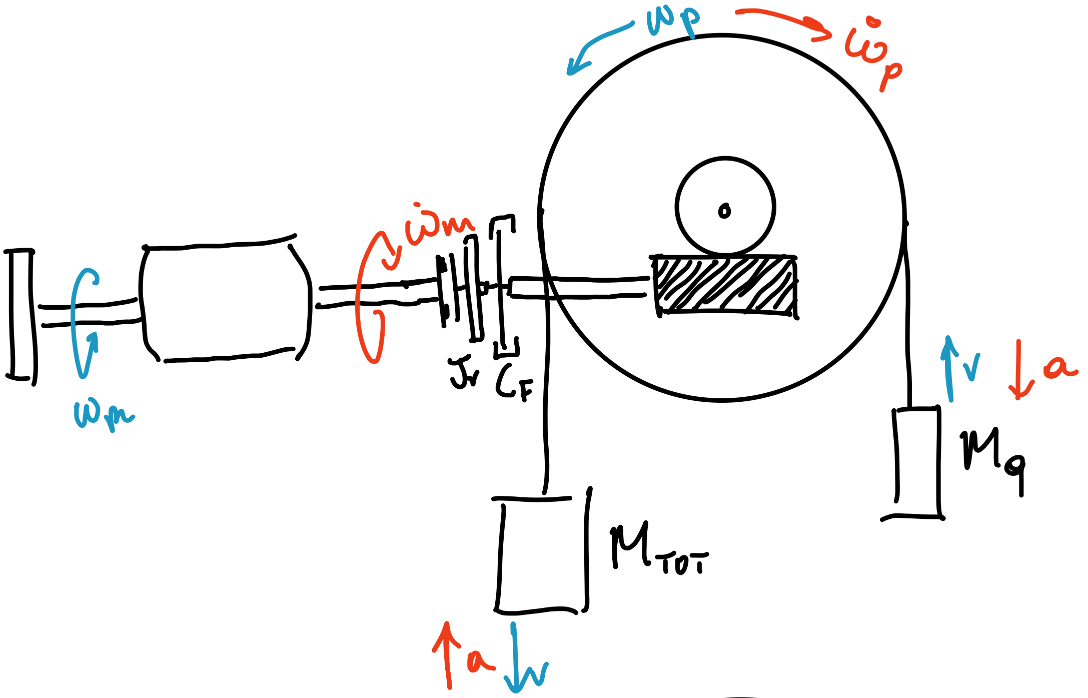


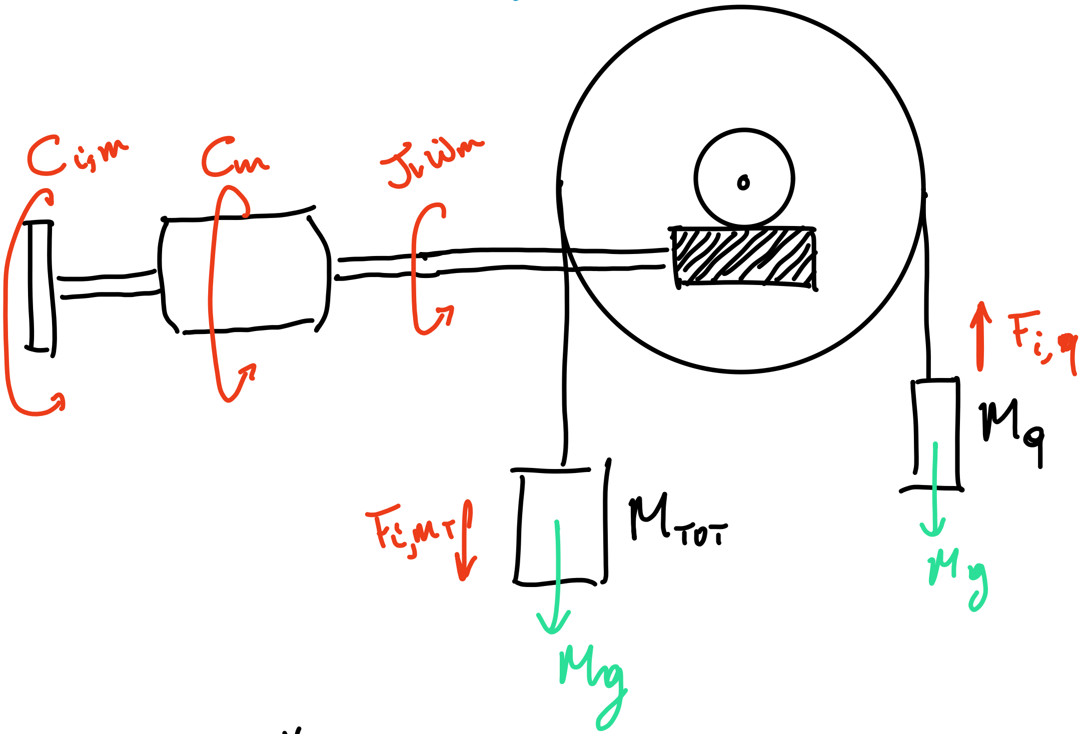
$$C_m \omega_m \eta_D - J_m \dot{\omega}_m \omega_m \eta_D - J_v \dot{\omega}_m \omega_m \eta_D + M_q g \omega_m \tau R - M_q \dot{\omega}_m \omega_m (\tau R)^2 - M_{TOT} \dot{\omega}_m \omega_m (\tau R)^2 - M_{TOT} g \omega_m \tau R$$

$$\dot{\omega}_m = \frac{C_m \eta_D + M_q g \tau R - M_{TOT} g \tau R}{J_m \eta_D + J_v \eta_D + M_q (\tau R)^2 + M_{TOT} (\tau R)^2} =$$

$$= \frac{63 + 88{,}29 - 137{,}34}{0{,}18 + 0{,}72 + 0{,}18 + 0{,}28} = \frac{13{,}95}{1{,}36} = 10{,}26 \ \frac{rad}{s^2}$$

$$C_G = C_m - J_m \dot{\omega}_m = 67{,}95 \ Nm$$





$$\omega_p = \tau\omega_m = \frac{v}{R}$$

$$\dot{\omega}_p = \tau\dot{\omega}_m = \frac{a}{R}$$

$$a = \dot{\omega}_m \tau R =$$

$$\frac{a}{\tau R} = \dot{\omega}_m = 50\ \frac{rad}{s}$$

$$C_m\omega_m = C_F\,\omega_m + J_m\dot{\omega}_m\omega_m + J_r\dot{\omega}_m\omega_m + \left(M_{TOT}\,g\,v + M_{TOT}\,a\,v + M_q\,a\,v - M_q\,g\,v\right)\eta_R$$

$$C_m\omega_m - C_F\omega_m + J_m\dot{\omega}_m\omega_m + J_r\dot{\omega}_m\omega_m + M_{TOT}\,g\,\tau R\,\omega_m\,\eta_R + M_{TOT}(\tau R)^2\,\dot{\omega}_m\cancel{\omega_m}\,\eta_R + M_q(\tau R)^2\,\dot{\omega}_m\cancel{\omega_m}\,\eta_R$$

$$- M_q\,g\,\omega_m\,\tau R\,\eta_R$$

$$C_m \cancel{\omega_m} + \left(M_{TOT}\, g\, \overset{\omega_m \tau R}{\cancel{\dot{x}}} - M_q\, g\, \overset{\omega_m \tau R}{\cancel{\dot{x}}}\right)\eta_R = 0$$

$$C_m = M_q\, g\, \tau R - M_{TOT}\, g\, \tau R = -39{,}05\ Nm$$

$$\omega_m = \omega_s\left(1 - \frac{C_m}{C_{m0}}\right) = 311{,}017\ \frac{rad}{s}$$

$$C_F = C_m + J_m \dot{\omega}_m + J_v \dot{\omega}_m + M_{TOT}\, g\, \tau R\, \eta_R + M_{TOT}\, \dot{\omega}_m (\tau R)^2 \eta_R + M_q\, \dot{\omega}_m (\tau R)^2 \eta_R - M_q\, g\, \tau R\, \eta_R$$

$$= 73{,}19\ Nm$$