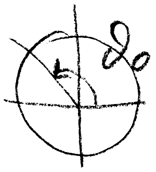
$$\begin{cases} -kR(1+\operatorname{sen}\theta) - \Phi_A \operatorname{sen}\theta = 0 \\ -mg + kR\cos\theta + \Phi_A \cos\theta = 0 \\ \frac{L}{2}(\hat{\imath}\operatorname{sen}\varphi - \hat{\jmath}\cancel{\cos\varphi}) \times (-mg\hat{\jmath}) = 0 \end{cases}$$

$$\frac{mgL}{2}\operatorname{sen}\varphi = 0 \quad \Rightarrow \operatorname{sen}\varphi = 0 \qquad \varphi = 0, \pi$$

$$\begin{cases} kR + (kR+\Phi_A)\operatorname{sen}\theta = 0 \\ mg - (kR+\Phi_A)\cos\theta = 0 \end{cases}$$

$$\tan\theta = -\frac{kR}{mg}$$



$T_1 \equiv (0, \theta_0) \quad T_2 \equiv (0, \theta_0 + \pi)$

$T_3 \equiv (\pi, \theta_0) \quad T_4 \equiv (\pi, \theta_0 + \pi)$

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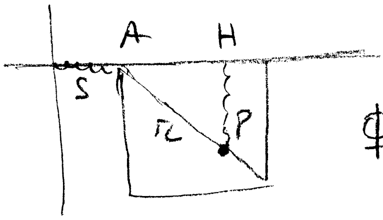
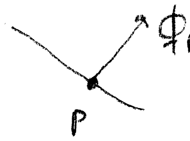
3) $l = 2 \qquad q_1 = s \qquad q_2 = r$



Φ_P reazione vincolare su P (forze interne)

$\Phi_P = \Phi_P\left(\frac{\hat{\imath}+\hat{\jmath}}{\sqrt{2}}\right)$



$\Phi_A = \Phi_A\hat{\jmath}$ reazione su A

$$\begin{cases} M\ddot{s}\hat{\imath} = -Mg\hat{\jmath} - ks\hat{\imath} - \Phi_P + \Phi_A \\ m\left(\ddot{s} + \frac{\ddot{r}}{\sqrt{2}}\right)\hat{\imath} - m\frac{\ddot{r}}{\sqrt{2}}\hat{\jmath} = -mg\hat{\jmath} + \frac{kr}{\sqrt{2}}\hat{\jmath} + \underline{\Phi_P} \end{cases}$$

$$\begin{cases} M\ddot{s} = -ks - \frac{\Phi_P}{\sqrt{2}} \\ 0 = -Mg - \frac{\Phi_P}{\sqrt{2}} + \Phi_A \\ m\left(\ddot{s} + \frac{\ddot{r}}{\sqrt{2}}\right) = \frac{\Phi_P}{\sqrt{2}} \\ -\frac{m\ddot{r}}{\sqrt{2}} = -mg + \frac{kr}{\sqrt{2}} + \frac{\Phi_P}{\sqrt{2}} \end{cases}$$

$\frac{\Phi_P}{\sqrt{2}} = m\left(\ddot{s} + \frac{\ddot{r}}{\sqrt{2}}\right)$ sostituendo nelle I

$$\begin{cases} (M+m)\ddot{s} + \frac{m}{\sqrt{2}}\ddot{r} + ks = 0 \\ -\frac{m\ddot{r}}{\sqrt{2}} = -mg + \frac{kr}{\sqrt{2}} + m\left(\ddot{s} + \frac{\ddot{r}}{\sqrt{2}}\right) \end{cases}$$

$$\begin{cases} (M+m)\ddot{s} + \frac{m}{\sqrt{2}}\ddot{r} + ks = 0 \\ \frac{m}{\sqrt{2}}\ddot{s} + m\ddot{r} + \frac{1}{2}kr = \frac{mg}{\sqrt{2}} \end{cases}$$