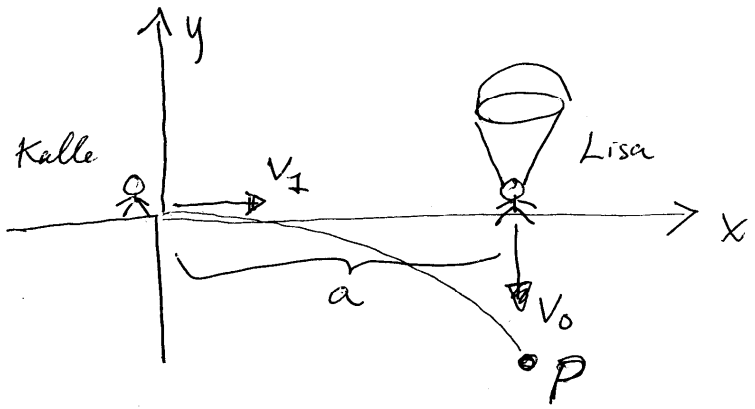
Lösningar Tentamen 5C1102, 070820

I



Revolvern och Lisa ska sammanstråla i punkten P.

Lisa

$y_L = -V_0 t$

Revolvern

$x_R = V_1 t$

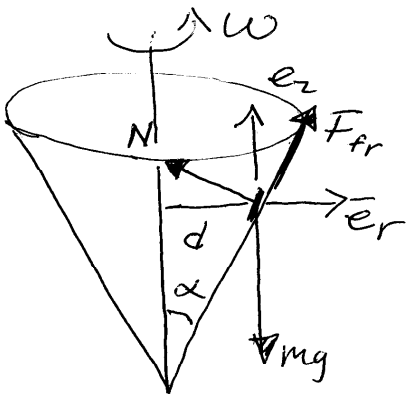
$y_R = -\frac{1}{2} g t^2$ (NII)

I punkten P gäller att $x_R = a \Rightarrow t = \frac{a}{V_1}$

$y_R = y_L \Rightarrow -V_0 \frac{a}{V_1} = -\frac{1}{2} g \left(\frac{a}{V_1}\right)^2 \Rightarrow$

$V_1 = \frac{1}{2} \frac{ga}{V_0}$

2



$F_{fr} = \mu N$

NII $\bar{e}_r$: $m(\ddot{r} - r\dot{\theta}^2) = -N\cos\alpha + F_{fr}\sin\alpha$

$\bar{e}_z$: $0 = -mg + N\sin\alpha + F_{fr}\cos\alpha$

$r = d \quad \ddot{r} = 0 \quad \dot{\theta} = \omega$

$$\left.\begin{aligned} md\omega^2 &= N\cos\alpha - \mu N\sin\alpha \\ 0 &= -mg + N\sin\alpha + \mu N\cos\alpha \end{aligned}\right\} \Rightarrow$$

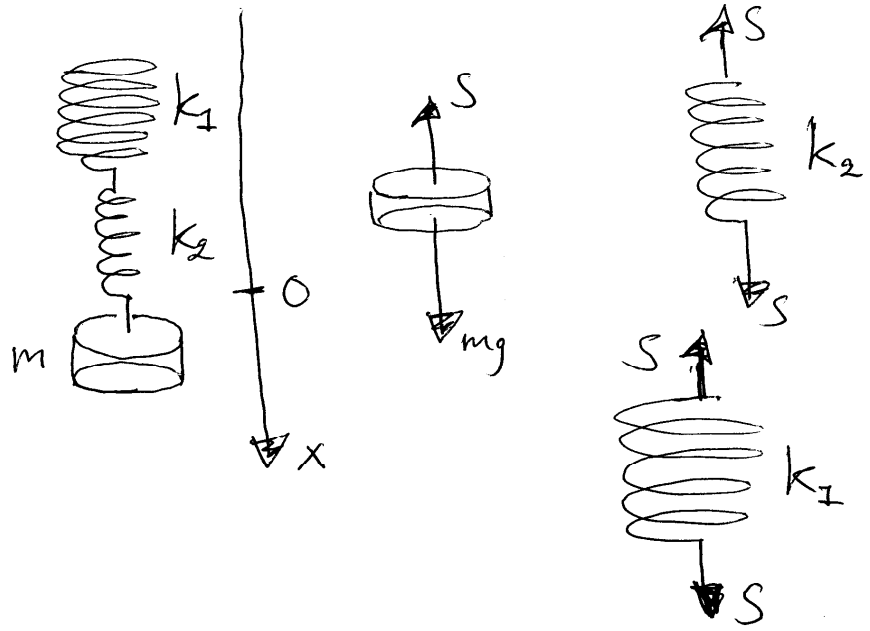
$$N(\sin\alpha + \mu\cos\alpha) = mg \Rightarrow N = \frac{mg}{\sin\alpha + \mu\cos\alpha}$$

$$md\omega^2 = N(\cos\alpha - \mu\sin\alpha) \Rightarrow$$

$$md\omega^2 = \frac{mg(\cos\alpha - \mu\sin\alpha)}{\sin\alpha + \mu\cos\alpha}$$

$$\omega = \sqrt{\frac{g(\cos\alpha - \mu\sin\alpha)}{d(\sin\alpha + \mu\cos\alpha)}}$$

3



Förlängningen av den övre fjädern: Δx_1

Förlängningen av den undre fjädern: Δx_2

Totala förlängningen: $x = \Delta x_1 + \Delta x_2$

$$S = k_1 \Delta x_1 = k_2 \Delta x_2 \Rightarrow$$

$$k_2 \Delta x_2 = k_1 (x - \Delta x_2) \Rightarrow \quad \Delta x_2 = \frac{k_1 x}{k_1 + k_2}$$

$$S = k_2 \Delta x_2 = \frac{k_1 k_2 x}{k_1 + k_2}$$

$$\text{NII}: \quad m\ddot{x} = -S + mg \quad \rightarrow$$

$$\ddot{x} + \frac{k_1 k_2}{m(k_1 + k_2)} x = g$$

$$\omega_0 = \sqrt{\frac{k_1 k_2}{m(k_1 + k_2)}}$$

$$T = \frac{2\pi}{\omega_0} = 2\pi \sqrt{\frac{m(k_1 + k_2)}{k_1 k_2}}$$

4

Se Exempel 12.1 sid 329
i Nicholas Apazidis
Mekanik lärobok!