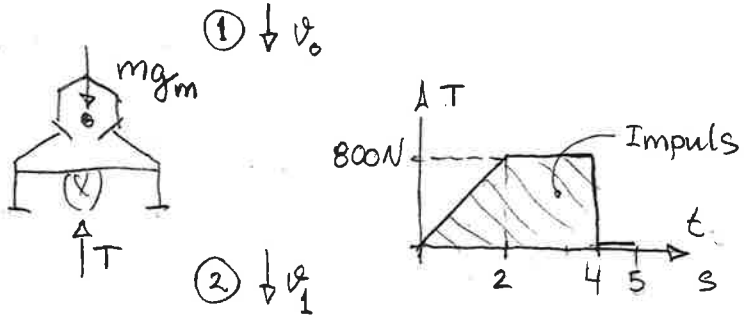
Seminariepass 16

1)



Impulslagen: $F = mg_m - T$

$$\int_0^{t_1} F\,dt = \Delta p \quad , \quad \Delta t = 5s$$

$t_1 = 5s$

$$(\downarrow) \quad \int_0^{t_1} (mg_m - T)\,dt = mv_1 - mv_0$$

$$mg_m \int_0^{t_1} dt - \int_0^{t_1} T\,dt = mv_1 - mv_0 \;;$$

$$v_1 = v_0 + g_m t_1 - \frac{1}{m}\int_0^{t_1} T\,dt$$

$$v_1 = 6 + 1.62 \cdot 5 - \frac{1}{200}\left(\frac{1}{2}800 \cdot 2 + 2 \cdot 800\right) =$$

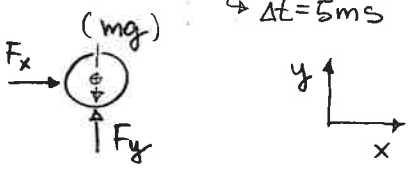
$$= 14.1 - 12 = 2.1\ m/s \rightarrow$$

12

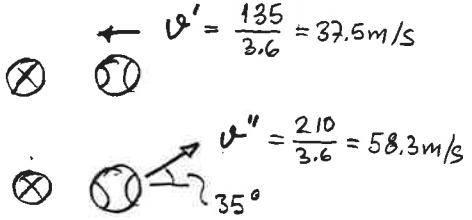
Sem. pass 16 forts

2)

Vid kontakt → $\Delta t = 5ms$



Före resp. efter stöt:



Impulslagen:

$$\underset{\sim}{I} = \Delta \underset{\sim}{p} \qquad \begin{cases} \underset{\sim}{I} = \int \underset{\sim}{F}\,dt \\ \Delta \underset{\sim}{p} = m\underset{\sim}{v}'' - m\underset{\sim}{v}' \end{cases}$$

$m = 0.146\ kg$

$$(\rightarrow) \quad F_x \cdot \Delta t = m v'' \cos 35° - (-m v')$$

$$(\uparrow) \quad F_y \cdot \Delta t = m v'' \sin 35° - 0 \;;$$

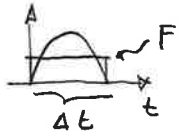
$$\begin{cases} F_x \cdot 0.005 = 0.146\,(58.3 \cdot \cos 35° + 37.5) \\ F_y \cdot 0.005 = 0.146\,(58.3 \sin 35° - 0) \end{cases} \;;$$

$$\begin{cases} F_x = 2.49\ kN \\ F_y = 0.98\ kN \end{cases}$$

$$F = \sqrt{F_x^2 + F_y^2} = 2.7\ kN$$

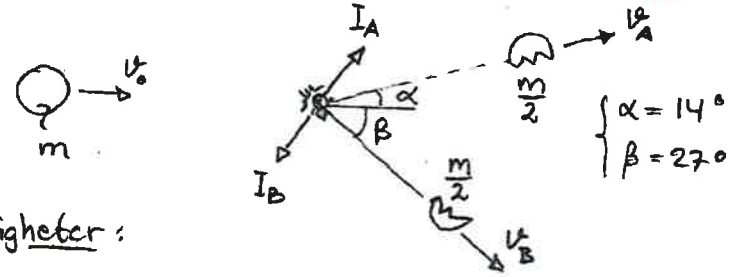
Ok försumma $mg = 1.4N$!

Anm. F_x och F_y är medelkraften i stöten



FΔt: samma impuls

3)



$\begin{cases} \alpha = 14° \\ \beta = 27° \end{cases}$

Hastigheter:

Totala rörelsemängden bevaras i x- resp. y-led:

$(\rightarrow)\ \frac{m}{2} v_A \cos 14° + \frac{m}{2} v_B \cos 27° = m v_0$

$(\uparrow)\ \frac{m}{2} v_A \sin 14° - \frac{m}{2} v_B \sin 27° = 0$

Numeriska värden ger:

$$\begin{cases} 0.970\, v_A + 0.891\, v_B = 6 & \dots (1) \\ 0.242\, v_A - 0.454\, v_B = 0 & \dots (2) \end{cases}$$

(2) $\Rightarrow v_A = \frac{0.454}{0.242} v_B$; $v_A = 1.876\, v_B$ insatt i (1) $\Rightarrow$

$(0.970 \cdot 1.876 + 0.891) v_B = 6$; $v_B = 2.21$ m/s

$v_A = 1.876 \cdot 2.21 = 4.15$ m/s

Impulsen: Betrakta del A som påverkas av I_A:

$(\rightarrow)\ I_{Ax} = \frac{1}{2} m v_A \cos 14° - \frac{1}{2} m v_0 = \dots = 0.513$ Ns

$(\uparrow)\ I_{Ay} = \frac{1}{2} m v_A \sin 14° = \dots = 0.502$ Ns

Newtons tredje lag: $\underset{\sim}{I}_A = -\underset{\sim}{I}_B \Rightarrow$

$$\begin{cases} I_{Bx} = -0.513\ \text{Ns} \\ I_{By} = -0.502\ \text{Ns} \end{cases}$$

$I = |\underset{\sim}{I}_A| = |\underset{\sim}{I}_B| = \sqrt{0.513^2 + 0.502^2} =$

$= 0.718$ Ns