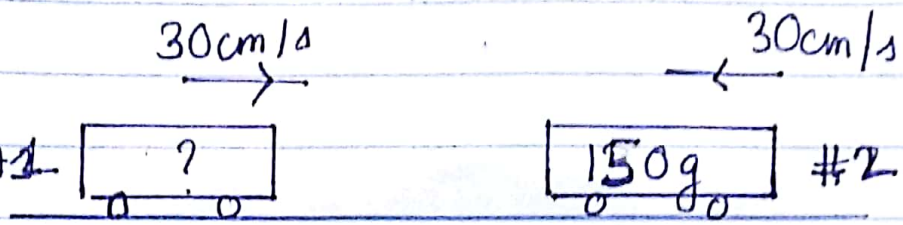
ECE 202
M2

(a)



$V_{1i} = 30\ cm/s$ $\quad V_{2i} = -30\ cm/s$

$V_{1f} = 0\ cm/s$ $\quad m_1 = ?$

$m_2 = 130\ g$ $\quad V_{2f} = ?$

(b) $$V_{1f} = \left(V_{1i}(m_1 - m_2) + 2m_2V_{2i}\right) / m_1 + m_2$$

$$\Rightarrow V_{1f}(m_1 + m_2) = \left(V_{1i}(m_1 - m_2) + 2m_2V_{2i}\right)$$

$$\Rightarrow V_{1f}m_1 + V_{1f}m_2 = V_{1i}m_1 - V_{1i}m_2 + 2m_2V_{2i}$$

$$\Rightarrow V_{1f}m_2 + V_{1i}m_2 - 2m_2V_{2i} = V_{1i}m_1 - V_{1f}m_1$$

$$\Rightarrow m_2\left(V_{1f} + V_{1i} - 2V_{2i}\right) = m_1(V_{1i} - V_{1f})$$

$$\Rightarrow \frac{m_2\left(V_{1f} + V_{1i} - 2V_{2i}\right)}{V_{1i} - V_{1f}} = m_1$$

$$\Rightarrow m_1 = \frac{m_2\left(V_{1f} + V_{1i} - 2V_{2i}\right)}{V_{1i} - V_{1f}}$$