

ROZWIAZANIE WYGENEROWANE PRZEZ CHAT GPT

7. Winda wznosi się z przyspieszeniem 1 m/s^2 . W momencie gdy jej prędkość wynosi 2 m/s , obluzowana śruba odpada z sufitu windy. Winda ma wysokość 2.5 m . Obliczyć czas po jakim śruba spadnie z sufitu na podłogę i odległość którą śruba pokona względem ścian budynku podczas spadania.

To solve this problem, we'll start by analyzing the motion of the screw. We need to calculate the time it takes for the screw to fall from the ceiling to the floor of the elevator and the distance it travels relative to the building walls.

Given: - The elevator is moving upwards with an acceleration $a = 1 \text{ m/s}^2$. - At the moment the screw detaches, the elevator's velocity is $v = 2 \text{ m/s}$. - The height of the elevator is $H = 2.5 \text{ m}$. - Gravity $g = 9.81 \text{ m/s}^2$.

Step-by-step solution:

1. Calculate the initial relative velocity of the screw. The initial velocity of the screw relative to the ground is 2 m/s upwards (the same as the elevator).
2. Motion of the screw relative to the elevator: - The initial relative velocity of the screw with respect to the elevator top is 0 because it detaches at rest with respect to the elevator. - The relative acceleration of the screw with respect to the elevator is $g + a = 9.81 + 1 = 10.81 \text{ m/s}^2$ downwards.
3. Calculate the time of flight t for the screw within the elevator. Using the equation for motion under constant acceleration:

$$s = v_0 t + \frac{1}{2} a t^2$$

Where: - $s = H = 2.5 \text{ m}$ - $v_0 = 0 \text{ m/s}$ - $a = 10.81 \text{ m/s}^2$

Substituting these values:

$$2.5 = 0 \cdot t + \frac{1}{2} \cdot 10.81 \cdot t^2$$

$$2.5 = 5.405 t^2$$

$$t^2 = \frac{2.5}{5.405}$$

$$t^2 \approx 0.4624$$

$$t \approx \sqrt{0.4624}$$

$$t \approx 0.68 \text{ s}$$

4. Calculate the distance traveled by the screw relative to the building. Use the equation for the distance the screw travels relative to the building:

$$d = vt + \frac{1}{2} (a_{\text{relative}}) t^2$$

Where: - $v = 2 \text{ m/s}$ (initial velocity of the screw relative to the building) - $a_{\text{relative}} = -g = -9.81 \text{ m/s}^2$

$$d = 2 \cdot 0.68 + \frac{1}{2} \cdot (-9.81) \cdot (0.68)^2$$

$$d \approx 1.36 - \frac{1}{2} \cdot 9.81 \cdot 0.4624$$

$$d \approx 1.36 - 2.266$$

$$d \approx -0.906 \text{ m}$$

The negative sign indicates that the screw moves 0.906 meters upward relative to its starting point (the building reference frame) before hitting the floor.

Conclusion: - The time it takes for the screw to hit the floor is approximately $t \approx 0.68 \text{ s}$. - The screw moves approximately 0.906 m downward with respect to the floor of the building.