

data
fecha 23.05.21

D S T Q Q S S
D L M M J V S

CEFET/RJ - SISTEMAS DE INFORMAÇÃO

FÍSICA - PROF. PATRICIA MANO SO

ALUNO JORGE WAMI HARBE

1º PERÍODO - 2021.1

2ª AVALIAÇÃO FÍSICA

1- $M = 4 \text{ kg}$ $m = 6 \text{ kg}$ $g = 10 \text{ m/s}^2$

a) $\vec{F}_R = m \cdot \vec{a}$

$$m \cdot g = (m + M) \cdot a$$

$$6 \cdot 10 = (10) \cdot a$$

$$60 = 10 \cdot a$$

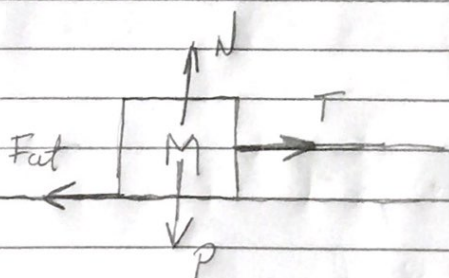
$$a = \boxed{4 \text{ m/s}^2}$$

b) $\vec{F}_R = m \cdot \vec{a}$

$$T = M \cdot a$$

$$T = 4 \cdot 9 = \boxed{36 \text{ N}}$$

c)



$$T = F_{at} = 36 \text{ N}$$

$$\mu \cdot N = 36 \text{ N}$$

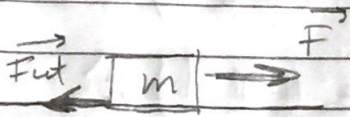
$$\mu \cdot M \cdot g = 36$$

$$\mu \cdot 40 = 36$$

$$\mu = \boxed{0,4}$$

2 - $m = 6 \text{ kg}$ $\mu_e = 0,7$ $\mu_k = 0,5$ $g = 10 \text{ m/s}^2$

a)



$$\vec{F} + \vec{F}_{at} = 0$$

$$F - F_{at} = 0$$

$$F = F_{at} = \mu_e \cdot N$$

$$F = 0,7 \cdot 6 \cdot 10$$

$$F = \boxed{42 \text{ N}}$$

b) Sim, $|\vec{a}| = ?$

$$|\vec{F}_r| = m \cdot |\vec{a}|$$

$$|\vec{F}_r| = |\vec{F}| - |\vec{F}_{atk}| = 45 - \mu_k \cdot N$$

$$F_r = 45 - 0,5 \cdot 6 \cdot 10 = 45 - 30 = 15$$

$$15 = m \cdot a \Rightarrow a = \frac{15}{6} = \boxed{2,5 \text{ m/s}^2}$$

3- $\vec{d}_i = (0,5\text{m})\hat{i} + (2,7\text{m})\hat{j} + (0,2\text{m})\hat{k} \quad t=0$

$\vec{d}_f = (7,0\text{m})\hat{i} + (3,7\text{m})\hat{j} + (4,2\text{m})\hat{k} \quad t=12\text{s}$

$\vec{F} = (10\text{N})\hat{i} + (5\text{N})\hat{j} + (7\text{N})\hat{k}$

a) $\vec{W} = \vec{F} \cdot \vec{d}$

$\vec{W} = 10 \cdot (7 - 0,5) + 5(3,7 - 2,7) + 7(4,2 - 0,2)$

$\vec{W} = 10 \cdot 6,5 + 5 \cdot 1 + 7 \cdot 4$

$\vec{W} = 65 + 5 + 28 = \boxed{98 \text{ J}}$

b) $P_{\text{med}} = \frac{W}{\Delta t} = \frac{98}{12} \approx \boxed{8,17 \text{ W}}$

4- $m = 1000 \text{ kg}$ $v_0 = 10 \text{ m/s}$ $h = 9,6 \text{ m}$

$g = 10 \text{ m/s}^2$ $E_{pc} = 0$

a) $E_{pa} = m \cdot g \cdot h = 1000 \cdot 10 \cdot 9,6 = \boxed{96000 \text{ J}}$

$E_{pb} = m \cdot g \cdot \frac{h}{2} = 1000 \cdot 10 \cdot 4,8 = \boxed{48000 \text{ J}}$

b) $U_A + K_A = U_0 + K_0$

$U_A - U_B = 0 \Rightarrow K_A = K_0$

$\frac{1}{2} \cdot m \cdot V_A^2 = \frac{1}{2} \cdot m \cdot V_0^2$

$V_A = V_0 = \boxed{10 \text{ m/s}}$

c) $U_0 + K_0 = U_B + K_B$

$U_0 + K_0 = U_{0/2} + K_B$

$K_B = K_0 + U_{0/2}$

$\frac{1}{2} m V_B^2 = \frac{1}{2} m \cdot V_0^2 + m \cdot g \cdot \frac{h}{2}$

$\frac{V_B^2}{2} = \frac{100}{2} + \frac{96}{2} \Rightarrow V_B^2 = \sqrt{196}$

$V_B = \boxed{14 \text{ m/s}}$

$$d) U_B + K_B = U_C + K_C + 18000$$

$$\frac{m \cdot g \cdot h}{2} + \frac{1}{2} m \cdot V_B^2 = \frac{1}{2} m \cdot V_C^2 + 18000$$

$$48000 + 98000 = 500 V_C^2 + 18000$$

$$500 V_C^2 = 128000$$

$$V_C^2 = 256 \Rightarrow V_C = \boxed{16 \text{ m/s}}$$

$$e) U_C + K_C = U_F + K_F$$

$$K_C = U_F$$

$$\frac{1}{2} \cdot m \cdot V_C^2 = m \cdot g \cdot h_F$$

$$V_C^2 = 2 \cdot 10 \cdot h_F$$

$$h_F = \frac{16^2}{20} = \boxed{12,8 \text{ m}}$$

5-

$$M = 5 \text{ kg}$$

$$m_1 = 3 \text{ kg} \quad V_1 = 3 \text{ m/s} \quad \text{norte}$$

$$m_2 = 2 \text{ kg} \quad V_2 = 5 \text{ m/s} \quad \text{norte do leste}$$

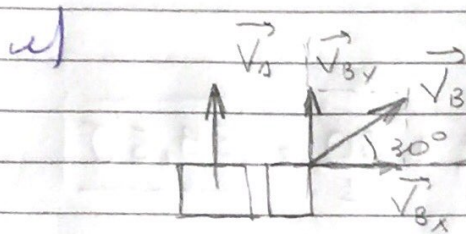
$$\sin 30^\circ = 0,5 \quad \cos 30^\circ = 0,87$$

$$V_{Bx} = V_B \cdot \cos 30^\circ$$

$$V_{Bx} = 5 \cdot 0,87 = 4,35 \text{ m/s}$$

$$V_{By} = V_B \cdot \sin 30^\circ$$

$$V_{By} = 5 \cdot 1/2 = 2,5 \text{ m/s}$$



$$\vec{V}_1 = 3\hat{j} \quad \vec{V}_2 = 4,35\hat{i} + 2,5\hat{j}$$

$$\vec{V}_c = \frac{m_1 \vec{V}_1 + m_2 \vec{V}_2}{M} = \frac{3(3\hat{j}) + 2(4,35\hat{i} + 2,5\hat{j})}{5}$$

$$\vec{V}_c = \frac{9\hat{j} + 8,7\hat{i} + 5\hat{j}}{5} = \frac{8,7\hat{i} + 14\hat{j}}{5} = 1,74\hat{i} + 2,8\hat{j}$$

$$b) \quad M \cdot \vec{V}_0 = m_1 \cdot \vec{V}_1 + m_2 \cdot \vec{V}_2$$

$$M \cdot V_{0x} + M \cdot V_{0y} = m_1 \cdot V_{1x} + m_1 \cdot V_{1y} + m_2 \cdot V_{2x} + m_2 \cdot V_{2y}$$

$$M \cdot V_{0x} + M \cdot V_{0y} = m_1 \cdot V_{1x} + m_1 \cdot V_{1y} + m_2 \cdot V_{2x} + m_2 \cdot V_{2y}$$

$$M \cdot V_{0x} = m_2 \cdot V_{2x}$$

$$5 \cdot V_{0x} = 2 \cdot 4,35$$

$$V_{0x} = 1,74$$

$$M \cdot V_{0y} = m_1 \cdot V_{1y} + m_2 \cdot V_{2y}$$

$$5 \cdot V_{0y} = 3 \cdot 3 + 2 \cdot 2,5$$

$$V_{0y} = 2,8$$

$$V_0^2 = V_{0x}^2 + V_{0y}^2$$

$$V_0^2 = 2,8^2 + 1,74^2$$

$$V_0 \approx 3,3 \text{ m/s}$$

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c) $K_0 = ?$ $K_f = ?$

$$K_0 = \frac{1}{2} \cdot M \cdot V_0^2 = \frac{1}{2} \cdot 5 \cdot (3,3)^2$$

$$K_0 = \boxed{27,225 \text{ J}}$$

$$K_f = \frac{1}{2} m_A \cdot V_A^2 + \frac{1}{2} m_B \cdot V_B^2$$

$$K_f = \frac{1}{2} \cdot 3 \cdot 3^2 + \frac{1}{2} \cdot 2 \cdot 5^2 = \frac{27}{2} + \frac{50}{2} = \boxed{38,5 \text{ J}}$$