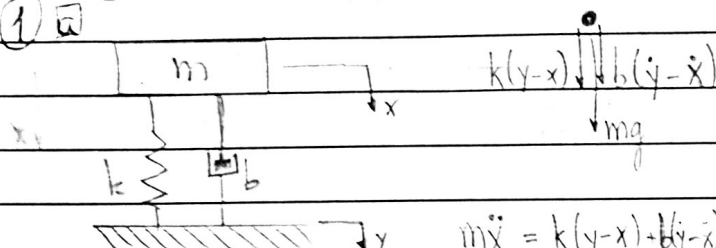


1 a

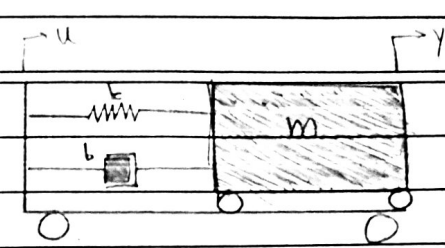


$$m\ddot{x} = k(y-x) + b(\dot{y}-\dot{x}) + mg$$

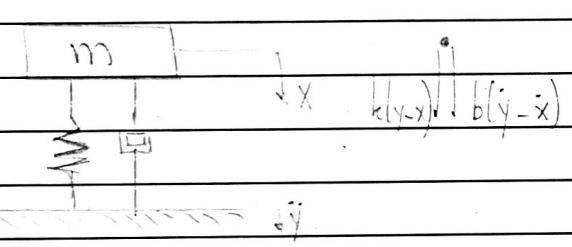
$$m\ddot{x} = k(y-x) + b(\dot{y}-\dot{x}) + mg$$

$$m\ddot{x} + b\dot{x} + kx = b\dot{y} + ky$$

3

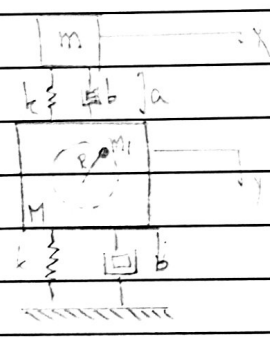


1 b



$$m\ddot{x} + b\dot{x} + kx = b\dot{y} + ky$$

2



TMB na massa superior:

$$m\ddot{x} = k(y-x) + b(\dot{y}-\dot{x})$$

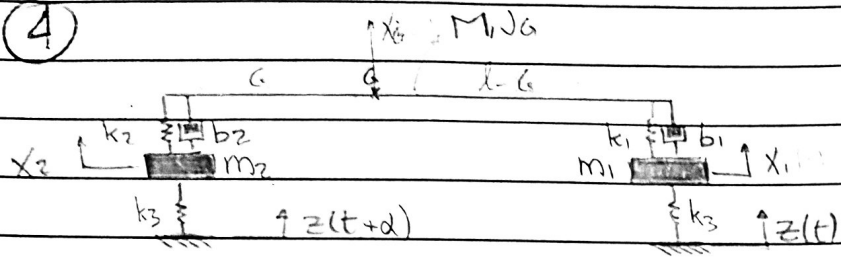
TMB na massa inferior:

$$M\ddot{y} = -ky - b\dot{y} - k(y-x) - b(\dot{y}-\dot{x}) + m_1 \omega r^2 \sin(\omega t)$$

$$M\ddot{y} + b\dot{y} + ky = m\ddot{x} + m_1 \omega r^2 \sin(\omega t) \quad \text{ou}$$

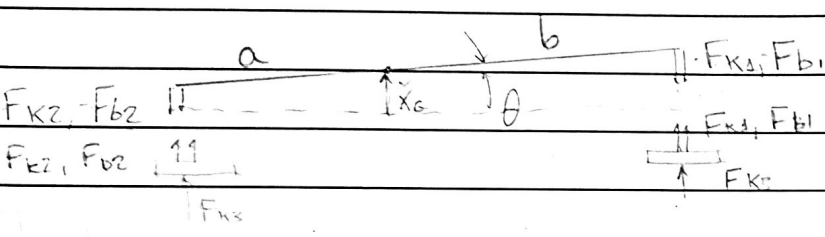
$$M\ddot{y} + 2b\dot{y} + 2ky = b\dot{x} + kx + m_1 \omega r^2 \sin(\omega t)$$

4



Num. equações: 4

Num. incógnitas: 4  $(x_1, x_2, x_G, \theta)$



$$\vec{F}_{k1} = k_1(x_G + (l-d)\sin\theta - x_1) \hat{i}$$

$$\vec{F}_{b1} = b_1(\dot{x}_G + (l-d)\dot{\theta}\cos\theta - \dot{x}_1) \hat{i}$$

$$\vec{F}_{k3} = k_3(x_1 - z(t)) \hat{i}$$

$$\vec{F}_{k2} = k_2(x_G - d\sin\theta - x_2) \hat{i}$$

$$\vec{F}_{b2} = b_2(\dot{x}_G - d\dot{\theta}\cos\theta - \dot{x}_2) \hat{i}$$

$$\vec{F}_{k3} = k_3(x_2 - z(t+d)) \hat{i}$$

$$\boxed{1} \quad m\ddot{x}_1 = k_1[x_G + b\sin\theta - x_1] + b_1[\dot{x}_G - \dot{x}_1 + b\dot{\theta}\cos\theta] + k_3(x_1 - z(t))$$

$$m\ddot{x}_1 = \dot{x}_1(k_3 - k_1) + k_1x_G + k_1b\sin\theta - b_1\dot{x}_1 + b_1\dot{x}_G + b_1\dot{\theta}b\cos\theta - k_3z(t)$$

$$m\ddot{x}_1 + b_1\dot{x}_1 - b_1\dot{x}_G - b_1\dot{\theta}b\cos\theta + (k_1 - k_3)x_1 - k_1x_G - k_1b\sin\theta = -k_3z(t)$$

$$\boxed{2} \quad m\ddot{x}_2 + b_2\dot{x}_2 - b_2\dot{x}_G + b_1\dot{\theta}b\cos\theta + (k_2 - k_3)x_2 - k_2x_G + k_1a\sin\theta = -k_3z(t+d)$$

$$\boxed{0} \quad m\ddot{x}_G = -F_{k1} - F_{k2} - F_{b1} - F_{b2}$$

$$J_G\ddot{\theta} = (F_{k2} + F_{b2})a - (F_{k1} + F_{b1})b$$