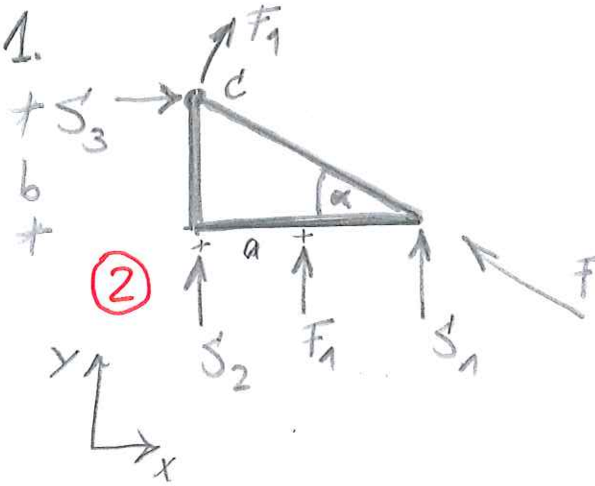
Musterlösung Nachholklausur Techn. Mech. RE & EP – 10.04.2014 / H. Baaser

1.



(2) $\rightarrow: \; S_3 + F_1 \sin\alpha - F_2 \cos\alpha = 0 \qquad (1)$

(2) $\uparrow: \; S_1 + S_2 + F_1 + F_1 \cos\alpha + F_2 \sin\alpha = 0 \qquad (2)$

$\overset{\curvearrowleft}{C}: \; -F_1 \cdot a - S_1 \cdot \dfrac{b}{\tan\alpha} = 0 \qquad (3)$ (2)

- aus (3): $S_1 = -F_1 \dfrac{a}{b} \tan\alpha$ (1)

- aus (2): $S_2 = F_1 \dfrac{a}{b} \tan\alpha - F_1 - F_1 \cos\alpha - F_2 \sin\alpha$

  $= F_1 \left(\dfrac{a}{b} \tan\alpha - 1 - \cos\alpha \right) - F_2 \sin\alpha$ (1)

- aus (1): $S_3 = F_2 \cos\alpha - F_1 \sin\alpha$ (1)

- $\underline{\alpha = 30°:}$ $\sin\alpha = \frac{1}{2}$; $\cos\alpha = \frac{1}{2}\sqrt{3}$; $\tan\alpha = \dfrac{\sqrt{3}}{3}$ (1)

$\Rightarrow S_1 = -F_1 \cdot \dfrac{a}{b} \cdot \dfrac{\sqrt{3}}{3}$ (1) ; $S_2 = F_1 \left(\dfrac{a}{b} \dfrac{\sqrt{3}}{3} - 1 - \dfrac{1}{2}\sqrt{3} \right) - \dfrac{1}{2} F_2$; (1)

$S_3 = \frac{1}{2}\sqrt{3}\, F_2 - \frac{1}{2} F_1$ (1)

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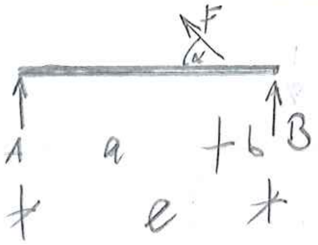
2. (1)

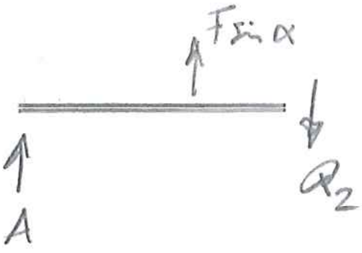


$\overset{\curvearrowleft}{A}: \; B \cdot l + F \sin\alpha \cdot a = 0$

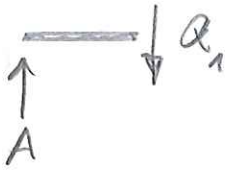
$B = -F \dfrac{a}{l} \sin\alpha$ (1)

$\uparrow: \; A + B + F \sin\alpha = 0$

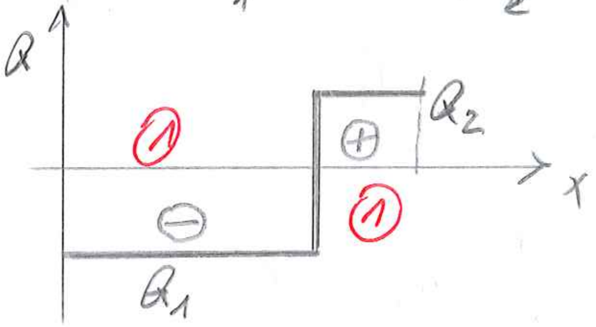
$A = F \left(\dfrac{a}{l} \sin\alpha - \sin\alpha \right) = -F \dfrac{b}{l} \sin\alpha$ (1)



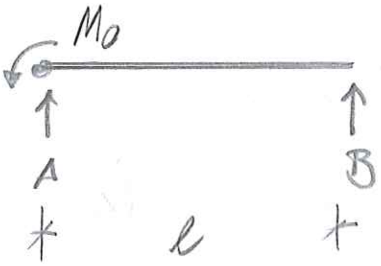
$$Q_2 = A + F\sin\alpha = -F\frac{b}{l}\sin\alpha + F\sin\alpha$$
$$= F\left(1-\frac{b}{l}\right)\sin\alpha = F\frac{a}{l}\sin\alpha$$



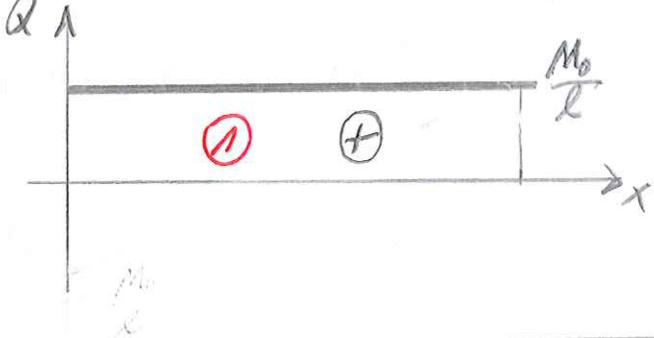
$$Q_1 = A = -F\frac{b}{l}\sin\alpha$$

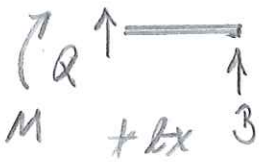


(2)



$B = -\frac{M_0}{l}$ 1 $\Rightarrow A = +\frac{M_0}{l}$ 1





3. Geschw. und Weg A: $v_A = \dot{\varphi}_0 r + a_A t \rightarrow s_A = \dot{\varphi}_0 r t + \frac{1}{2} a_A t^2$ 3 2

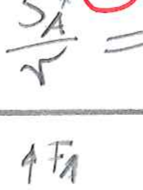
—||— B: $v_B = \dot{\varphi}_0 r + \frac{1}{2} a_A t \rightarrow s_B = \pi r + \dot{\varphi}_0 r t + \frac{1}{4} a_A t^2$

a) Treffen: $s_A \overset{!}{=} s_B \Rightarrow \frac{1}{2} a_A t^2 = \pi r + \frac{1}{4} a_A t^2 \Rightarrow t^2 = \frac{4\pi r}{a_A}$ 2 3 3

$\Rightarrow t^* = 2\sqrt{\frac{\pi r}{a_A}}$ 1

b) $\varphi^* = \frac{s_A^*}{r} = \dot{\varphi}_0 \cdot 2\sqrt{\frac{\pi r}{a_A}} + 2\pi = \frac{s_B^*}{r}$ ✓ 2 1

4. FKB: 3



$\downarrow$: $m\ddot{x} = -F_1 + F_2 = -c_1 x - c_2 x$ 3

$\rightsquigarrow m\ddot{x} + (c_1 + c_2)x = 0$

3 $\ddot{x} + \frac{c_1 + c_2}{m} x = 0 \Rightarrow \omega = \sqrt{\frac{c_1 + c_2}{m}}$ 2