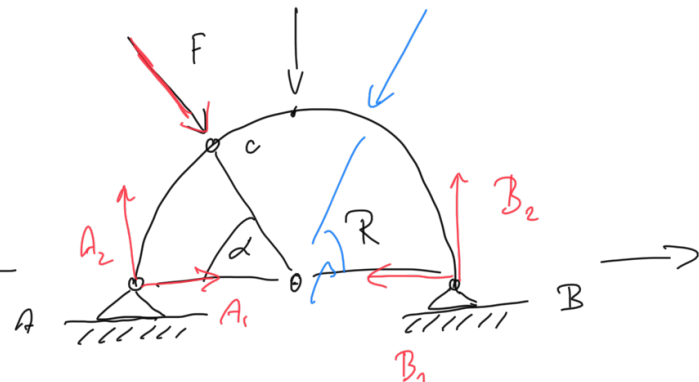
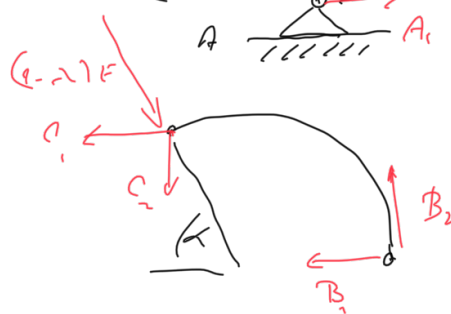
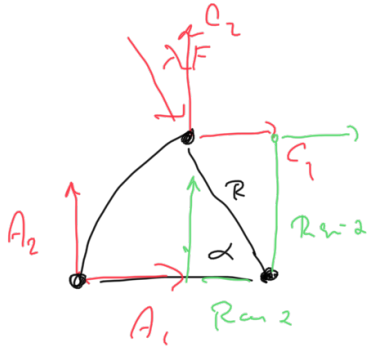


Vaje 25. marec 2021

1. Tročleni lok. Določi sile podpor.



$$F = \lambda F + (1-\lambda)F$$

Davnejsine
može za tročleni lok

$$C_1 + A_1 + \lambda F \cos \alpha = 0$$

$$C_2 + A_2 - \lambda F \sin \alpha = 0$$

$$-R A_2 - R \sin \alpha C_1 - R \cos \alpha C_2 = 0$$

$$A_1 - B_1 + F \cos \alpha = 0$$

$$A_2 + B_2 - F \sin \alpha = 0$$

$$R B_2 - R A_2 = 0$$

$$A_2 = B_2$$

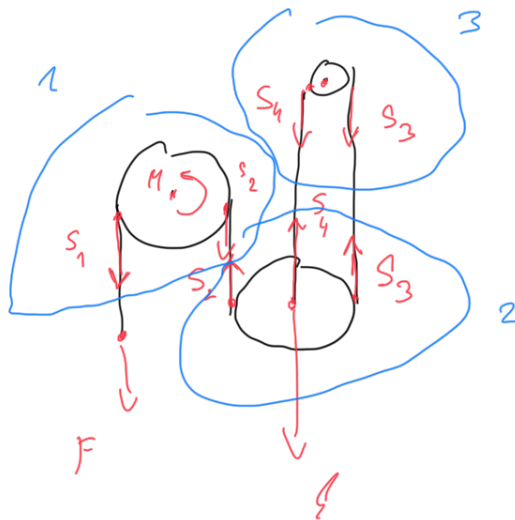
$$2A_2 = F \sin \alpha$$

$$A_2 = B_2 = \frac{1}{2} F \sin \alpha$$

$$A_1 = -C_1 - \lambda F \cos \alpha = F \left(\frac{1}{2} + \left(\lambda - \frac{1}{2} \right) \cos \alpha \right) - \lambda F \cos \alpha = F \left(\frac{1}{2} - \frac{1}{2} \cos \alpha \right) = \frac{1}{2} F (1 - \cos \alpha)$$

$$B_1 = A_1 + F \cos \alpha = \frac{1}{2} F (1 - \cos \alpha) + F \cos \alpha = \frac{1}{2} F (1 + \cos \alpha)$$

2. Škripčevje, določi silo vrvi.



$$S_1 = F$$

$$M + R S_1 - R S_2 = 0$$

$$R S_3 - R S_2 = 0 \Rightarrow S_2 = S_3$$

$$S_2 + S_3 + S_4 - \ell = 0$$

$$R_1 = R, R_2 = R, R_3 = \frac{1}{2}R$$

$$R S_4 - R S_3 = 0 \Rightarrow S_3 = S_4 = S_2 = \frac{1}{3} \ell$$

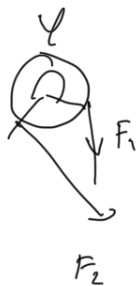
$$S_1 = S_2 - \frac{M}{R} = \frac{1}{3} \ell - \frac{M}{R}$$

$$F = \frac{1}{3} \ell - \frac{M}{R}$$

Pogoj, da vrvi ne zdrsnemo na prvo kolutu.

$$S_2 \leq S_1 e^{k \cdot \pi} \Rightarrow \frac{1}{3} \ell \leq \left(\frac{1}{3} \ell - \frac{M}{R} \right) e^{k \pi}$$

$$\frac{1}{3} \ell (1 - e^{k \pi}) \leq - \frac{M}{R} e^{k \pi}$$



$$F_2 = F_1 e^{k \varphi}$$

~~$$\ell \leq \frac{3 e^{k \pi}}{e^{k \pi} - 1} \frac{M}{R}$$~~

$$e^x > 1$$

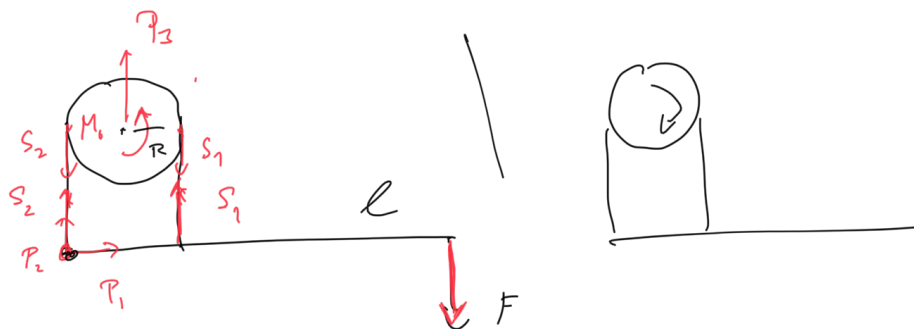
$$\Leftrightarrow x > 0$$

$$\ell \geq \frac{3 e^{k \pi}}{e^{k \pi} - 1} \frac{M}{R}$$



$$M \leq \frac{R \ell (e^{k \pi} - 1)}{3 e^{k \pi}}$$

3. Tračna zavora. Določi silo na ročico zavore tako, da bo zavorni moment enak M_0 . Obravnavaj primera za vrtenje v smeri uriniga in protiurnega kazalca.



$$P_1 = 0$$

$$P_2 + S_2 + S_2 - F = 0$$

$$-lF + 2RS_2 = 0$$

$$P_3 - S_1 - S_2 = 0$$

$$M_0 + RS_2 - RS_1 = 0$$

$$P_1, P_2, S_1, S_2, P_3, F$$

$$S_1 = S_2 e^{k\pi}$$

$$F = \frac{2R}{l} S_1$$

$$F = \frac{2R}{l} \frac{M_0 e^{k\pi}}{e^{k\pi} - 1}$$

$$R(S_1 - S_2) = M_0$$

$$S_2(e^{k\pi} - 1) = M_0 / R$$

$$S_2 = \frac{M_0 / R}{e^{k\pi} - 1}$$

$$S_2 = S_1 e^{-k\pi}$$

summa ostane
kalkuliraj

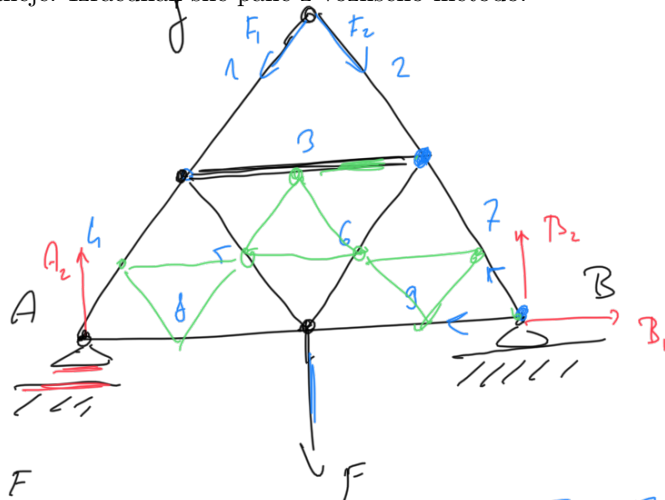
$$R(S_1 - S_2) = M_0$$

$$S_1(1 - e^{-k\pi}) = M_0 / R$$

$$S_1 = \frac{M_0 / R}{1 - e^{-k\pi}}$$

$$F = \frac{2R M_0}{l(1 - e^{-k\pi})}$$

4. Trikotno paličje. Izračunaj sile palic z vozliščno metodo.



$$\sin \frac{\pi}{3} = \frac{\sqrt{3}}{2}$$

$$\cos \frac{\pi}{3} = \frac{1}{2}$$

$$F_5 = F_6$$

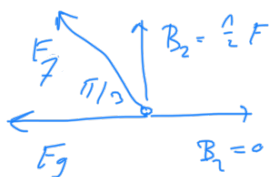
$$F_8 = F_9$$

$$F_4 = F_7$$

$$B_2 = A_2 = \frac{1}{2} F$$

$$B_1 = 0$$

$$F_1 = F_2 = 0$$

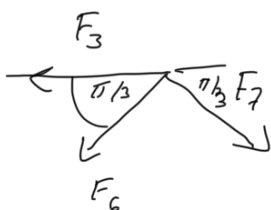


$$-F_9 - F_7 \cos \frac{\pi}{3} = 0$$

$$\frac{1}{2} F + F_7 \sin \frac{\pi}{3} = 0$$

$$F_7 = -\frac{1}{2} F \frac{1}{\sin \frac{\pi}{3}} = -\frac{F}{\sqrt{3}}$$

$$F_9 = -F_7 \cdot \frac{1}{2} = \frac{F}{2\sqrt{3}}$$



$$-F_3 - F_6 \cos \frac{\pi}{3} + F_7 \cos \frac{\pi}{3} = 0$$

$$-F_6 \sin \frac{\pi}{3} - F_7 \sin \frac{\pi}{3} = 0 \Rightarrow F_6 = -F_7 = F \frac{1}{\sqrt{3}}$$

$$F_3 = -F_6 \frac{1}{2} + F_7 \frac{1}{2} = -\frac{1}{2} F \frac{1}{\sqrt{3}} + \left(-F \frac{1}{\sqrt{3}}\right) \frac{1}{2} = -\frac{3}{2} F \frac{1}{\sqrt{3}}$$

$$= -F \frac{1}{\sqrt{3}} = -\frac{\sqrt{3}}{2} F$$

$$F_3 = -\frac{\sqrt{3}}{2} F = -\frac{3}{2\sqrt{3}} F = -F \frac{1}{\sqrt{3}}$$

$$F_6 = \frac{1}{\sqrt{3}} F$$

$$F_7 = \frac{1}{\sqrt{3}} F$$

$$F_9 = \frac{1}{2\sqrt{3}} F$$

5. Za dano paličje v obliki mosta izračunaj:

- sile v podporah;
- sile označenih palic.

