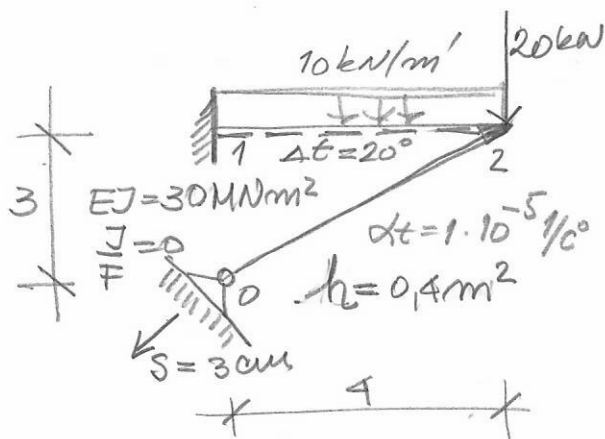


11.09.2020.

OTPORNOST MATERIJALA 2

1) ZA NOSIČ I OPTEREĆENJE NA SKICI TREBA:



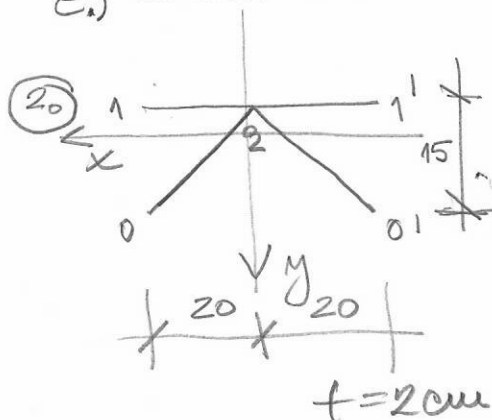
a) ZA ZADATO OPTEREĆENJE
 SRAČUNATI I NACRTATI
 DIJAGRAME PRESEČNH SILA

b) ZA $\Delta t = 20^\circ\text{C}$ NA DELU
 1-2 NACRTATI DIJAGRAM
 MOMENATA SAVIJANJA

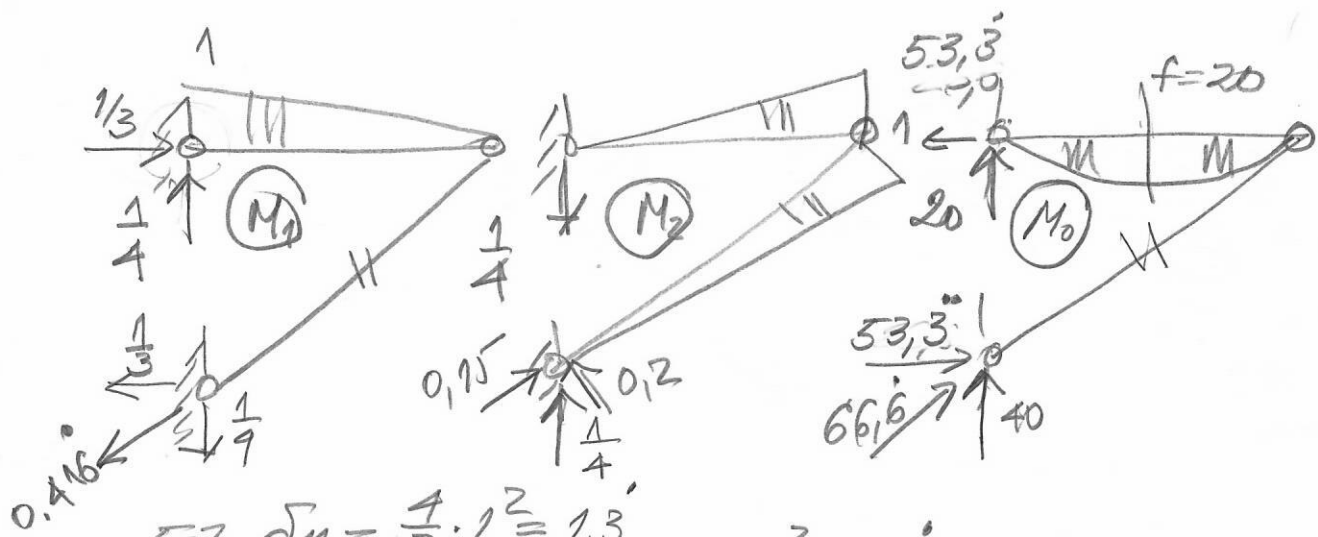
c) NACRTATI DIJAGRAM
 MOMENATA OD $S = 3\text{ cm}$
 U PRAVCU OJETA 0-2

d) SRAČUNATI OBRTAJNE ČVORA 2.

e) SKICIRATI DEFORMISANU OSU NOSIČA



ODREDITI RASPORED NAPONA
 SMICANJA OD $T_y = 30\text{ kN}$
 I ODREDITI POLOŽAJ CENTRA
 SMICANJA



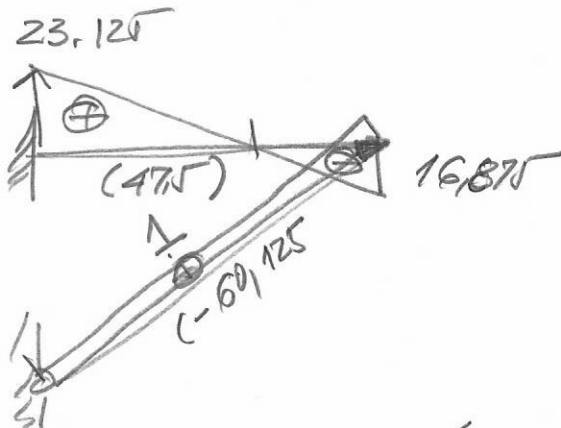
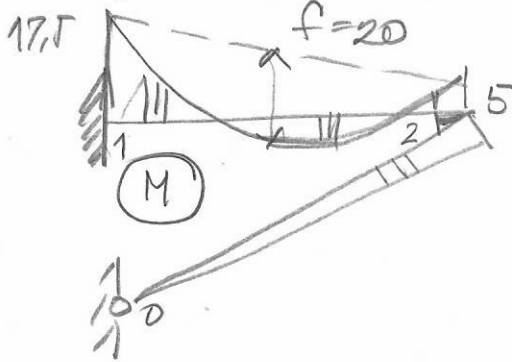
$$EJc \delta_{11} = \frac{4}{3} \cdot 1^2 = 1,3$$

$$EJc \delta_{12} = EJc \delta_{21} = \frac{4}{6} \cdot 1^2 = 0,6$$

$$EJc \delta_{22} = \frac{1}{3} (4+5) \cdot 12 = 3$$

$$EJc \delta_{10} = EJc \delta_{20} = \frac{4}{3} (-1) \cdot 20 = -26,6$$

$$x_1 = 17,5 \quad x_2 = 5$$



$$T_{12} = \frac{4 \cdot 20}{4} + \frac{17,5 - 5}{4} = 23,125$$

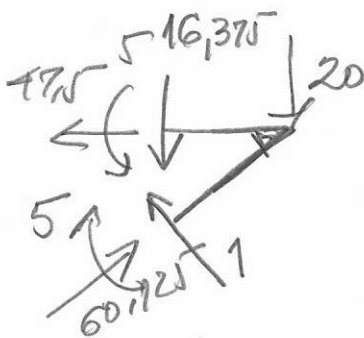
$$\frac{z_0}{23,125} = \frac{4}{40}$$

$$T_{21} = -\frac{4 \cdot 20}{4} + \frac{17,5 - 5}{4} = -16,875$$

$$z_0 = 2,3125 \text{ (m)}$$

$$N_{12} = 53,3 - \frac{1}{3} \cdot 17,5 = 47,5$$

$$N_{02} = -66,6 + 0,416 \cdot 17,5 - 0,15 \cdot 5 = -60,125 \text{ kN}$$



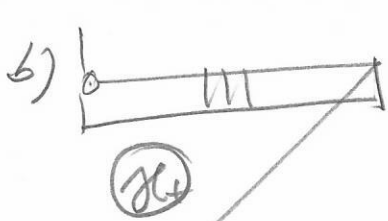
$$\sum H = 47,5 - 60,125 \cdot 0,8 + 1 \cdot 0,6 = 0$$

$$0 = 0 \checkmark$$

$$\sum V = 60,125 \cdot 0,6 + 1 \cdot 0,8 - 16,875 - 20 = 0$$

$$0 = 0 \checkmark$$

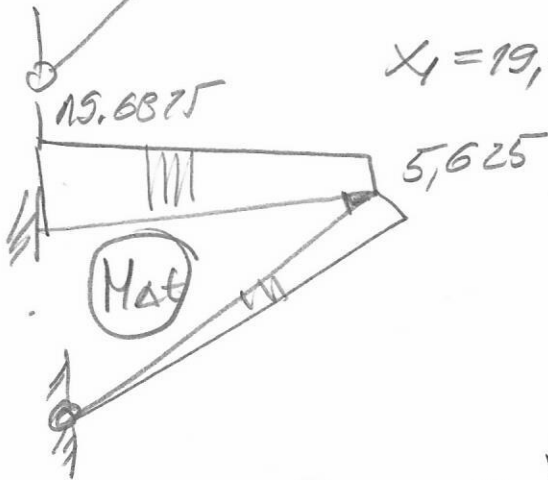
$$\sum M = 5 - 5 = 0 \quad 0 = 0 \checkmark$$



$$EJc \delta_{1at} = EJc \delta_{2at} =$$

$$= 30 \cdot 10^3 \cdot 1 \cdot 10 \cdot \frac{-5 \cdot 20}{04} \cdot (-1) \frac{4}{2} = -30$$

$$X_1 = 19,6875 \text{ kNm} \quad X_2 = 5,625 \text{ kNm}$$

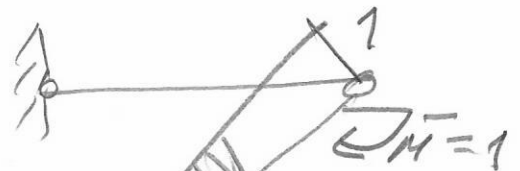
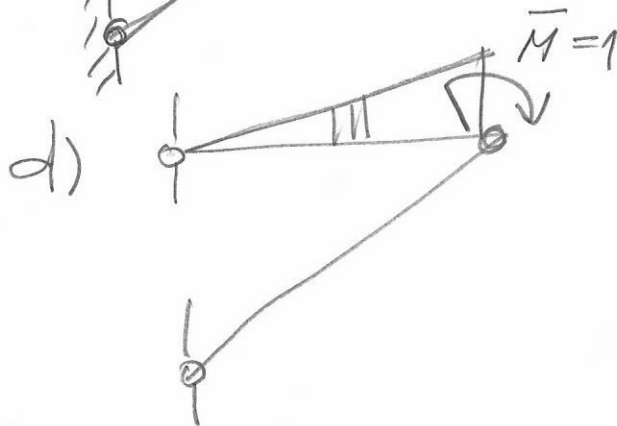
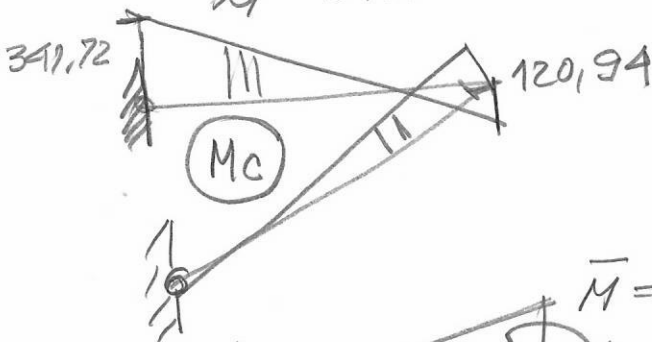


c)

$$EJc \delta_{1c} = -30 \cdot 10^3 \cdot 0,415 \cdot 3 \cdot 10^{-2} = -375$$

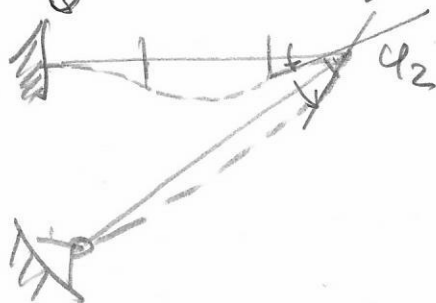
$$EJc \delta_{2c} = -30 \cdot 10^3 \cdot (-0,15) \cdot 3 \cdot 10^{-2} = 135$$

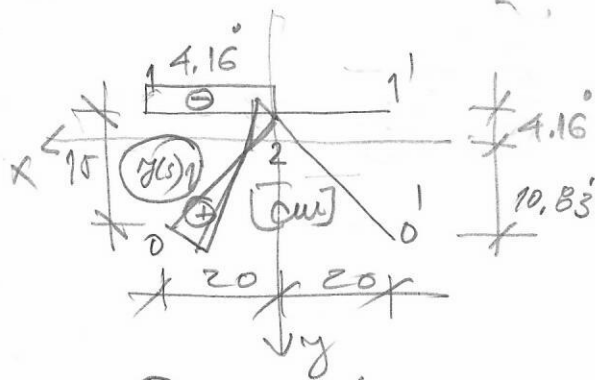
$$X_1 = 341,72 \quad X_2 = -120,94$$



$$EJc \varphi_2 = -\frac{5}{3} \cdot 1,5 = -8,3 \quad \varphi_2 = -0,27 \cdot 10^{-3} \text{ rad}$$

$$EJc \varphi_2 = \frac{1}{6} \cdot 1 \cdot (17,5 + 2,5) + \frac{4}{3} \cdot (-20) \cdot 1 = -8,3$$





$$y_1' = \frac{2(2 \times 25 \cdot 75)}{2(2(25+20))} = 4.16 \text{ cm}$$

$$J_x = 2 \cdot 2 \cdot \left[20 \cdot 4.16^2 + \frac{25}{3} (4.16^2 - 4.16 \cdot 10.83 + 10.83^2) \right]$$

$$J_x = 4375 \text{ cm}^4$$

$$\tilde{S}_{x2L} = \tilde{S}_{x2D} = 2 \cdot 20 \cdot (-4.16) = -166.6 \text{ cm}^3$$

$$\tilde{S}_{x,2dd} = \tilde{S}_{x,dL} = -2 \cdot 25 \left(10.83 - \frac{75}{2} \right) = -166.6 \text{ cm}^3$$

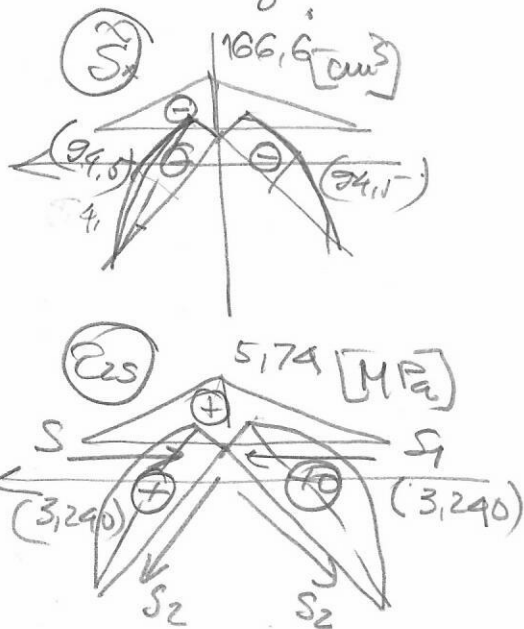
$$\tilde{S}_{x,01} = -2 \cdot \frac{25}{2} \left(10.83 - \frac{75}{2} \right) = -177.83 \text{ cm}^3$$

$$f = -177.83 + \frac{166.6}{2} = -94.5 \text{ cm}^3$$

$$\sigma_{25,12} = - \frac{30 \cdot 10^{-3} \cdot (-166.6) \cdot 10^{-6}}{4375 \cdot 10^{-8} \cdot 2 \cdot 10^{-2}}$$

$$= 0.034 \cdot 166.6 = 5.714 \text{ MPa}$$

$$f = 0.034 \cdot 94.5 = 3.240 \text{ MPa}$$



$$S_2 = 2 \cdot 25 \cdot 10^{-9} \left(\frac{5.714}{2} + \frac{2}{3} 3.240 \right) \cdot 10^3 = 25.085 \text{ kN}$$

$$\sum V = 30 - 2 \cdot 25.085 \cdot 0.6 = 0$$

$$0.1 \approx 0 \text{ V}$$

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PRESEKU KRAJKOVA

$$\sum M_2 = 0 \text{ V} \quad S(0; -4.16)$$