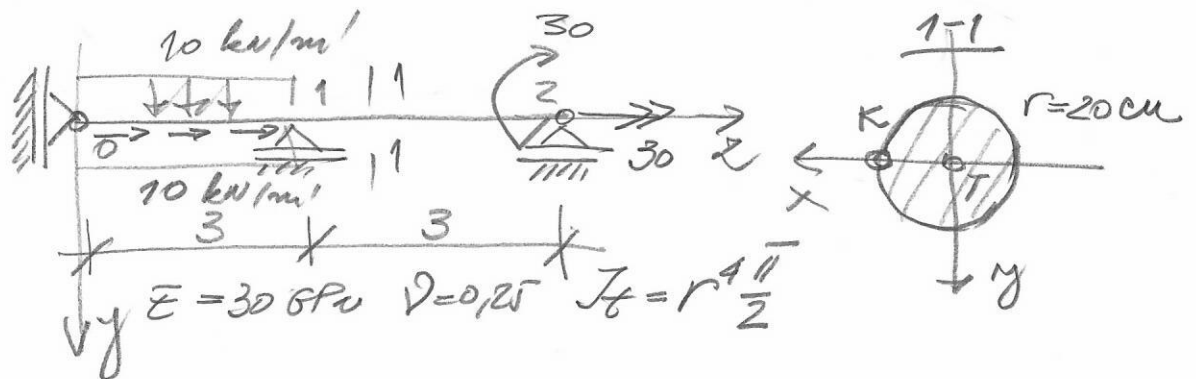


UNIVERZITET U BANJALUCI
 ARHITEKTONSKO-GRADUVINSKO-GEODEZSKI FAKULTET
 KATEORA ZA MEHANIKU I TEORIJU KONSTRUKCIJA
 STUDIJSKI PROGRAM GRADUVINARSTVO

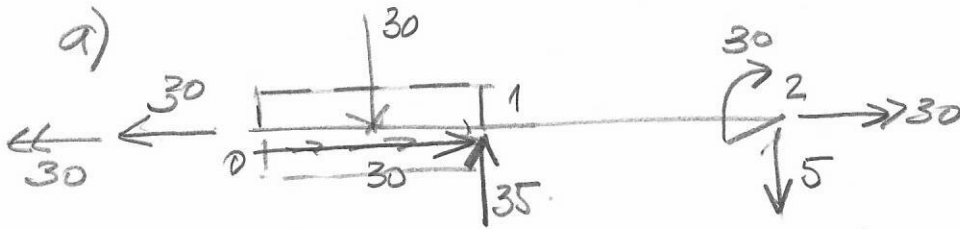
26.02.2024.

DIPLOMSKI MATERIJAL 1

ZA NOSAČ I OPIREĆE UJE NA SKICI TREBA:



- SRACUNATI I NACRTATI DIJAGRAME KOMP. NAPONA U PRESEKU 1 LEVO. (OSLOD NAC 0 JE TORZIONO KRUG)
- IZVRŠITI ANALIZU STAVJA NAPONA U TAČKI K PRESEKA 1 LEVO I NACRTATI MREŽU KRUG NAPONA
- INTEGRACIJOM D.J. ODREDITI v_0 , ψ_1 I w_1
- MOR-MAKSVELOVOM ANALOGIJOM ODREDITI v_0 , ψ_1 I ψ_2
- SKICIRATI DEF. OSU NOSAČA



$$M_{HL} = -30 \cdot 15 = -45 \text{ kNm}$$

$$T_{LL} = -30 \text{ kN}$$

$$N_{1L} = 0 \text{ kN}$$

$$M_E = 30 \text{ kNm}$$

$$F = 20 \pi = 1256,64 \text{ cm}^2$$

$$J_X = \frac{20^4 \pi}{4} = 125663,71 \text{ cm}^4$$

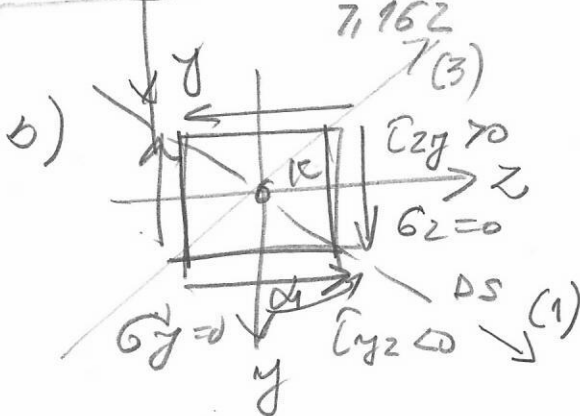
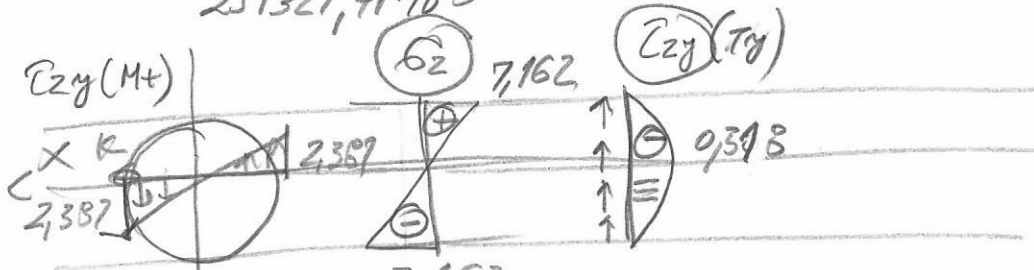
$$J_t = 2 \cdot \frac{20^4 \pi}{4} = 251327,41 \text{ cm}^4$$

$$\sigma_z(N) = \frac{0 \times 10}{1256,64 \times 10^{-4}} = 0 \text{ MPa}$$

$$\sigma_z(M_x) = \frac{-45 \cdot 10^{-3} \cdot 0,120}{125663,71 \cdot 10^{-8}} = 7,162 \text{ MPa}$$

$$\max \tau_{zy}(T_y) = \frac{4}{3} \cdot \frac{-30 \times 10^{-3}}{1256,64 \cdot 10^{-4}} = -0,318 \text{ MPa}$$

$$\tau_{zt} = \frac{-30 \cdot 10^{-3} \cdot 0,12}{251327,41 \cdot 10^{-8}} = 2,387 \text{ MPa}$$

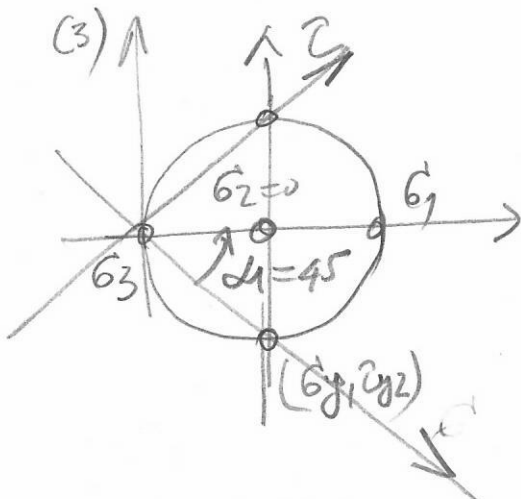


$$\sigma_z^k = 0$$

$$\tau_{zy}^k = -\tau_{yz}^k = 2,387 - 0,318 = 2,068 \text{ MPa}$$

$$\alpha_1 = 45^\circ$$

$$\sigma_1 = -\sigma_3 = 2,068 \text{ MPa}$$



$$\tan 2\alpha = \frac{-2 \cdot (-2,068)}{0 - 0} = \frac{(+)}{(0)}$$

$$\sigma = (1)$$

$$2\alpha = 90^\circ \quad \alpha = 45^\circ$$

$$\sigma_{\max/\min} = \frac{0+0}{2} \pm \sqrt{\left(\frac{0-0}{2}\right)^2 + \tau_{zy}^2} =$$

$$= \pm 2,068 \text{ MPa} \quad \left\{ \begin{array}{l} \sigma_1 = 2,068 \\ \sigma_2 = 0 \\ \sigma_3 = -2,068 \end{array} \right.$$

c) $M_x(z) = -5z^2 \quad 0 \leq z \leq 3 \text{ m}$

$EJ_x v''(z) = -5z^2 \quad EJ_x = 30 \cdot 10^3 \cdot 125663,71 = 37,70 \text{ MNm}^2$

$EJ_x v'(z) = C_1 + \frac{5}{3}z^3 \quad EJ_x v'(3) = C_1 + \frac{5}{3} \cdot 3^3 = 0 \quad C_1 = -45$

$EJ_x v(z) = C_2 + C_1 z + \frac{5}{12}z^4 \quad EJ_x v(3) = C_2 - 45 \cdot 3 + \frac{5}{12} \cdot 3^4 \quad C_2 = 109,25$

$v_0 = v(0) = \frac{109,25 \cdot 10^{-3}}{37,70} = \underline{\underline{2,886 \cdot 10^{-3} \text{ m}}}$

$M_t(z) = 30 \quad GJ_t = \frac{30 \cdot 10^3}{2(1+0,25)} \cdot 2 \cdot 125663,71 = \frac{EJ_x}{1,25} = 30,16 \text{ MNm}^2$

$GJ_t \varphi_2(z) = 30$

$GJ_t \varphi_2(z) = C_1 + 30z \quad GJ_t \varphi_2(0) = C_1 + 30 \cdot 0 = 0 \quad C_1 = 0$

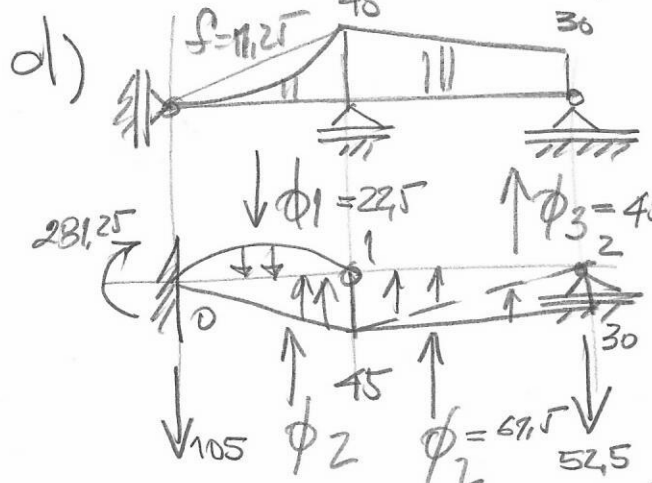
$\varphi_{t2} = \varphi_2(3) = \frac{30 \cdot 3 \cdot 10^{-3}}{30,16} = \underline{\underline{2,984 \cdot 10^{-3} \text{ rad}}}$

$N(z) = 30 - 10z \quad EF = 30 \cdot 10^3 \cdot 1256,69 = 3769,92 \text{ MN}$

$EF w'(z) = 30 - 10z$

$EF w(z) = C_1 + 30z - 5z^2 \quad EF w(0) = C_1 = 0$

$w_1 = w(3) = \frac{30 \cdot 3 - 5 \cdot 3^2}{3769,92 \cdot 10^3} = \underline{\underline{0,119 \cdot 10^{-3} \text{ m}}}$



$\phi_1 = \frac{2}{3} \cdot 3 \cdot 11,25 = 22,5$

$\phi_2 = \frac{45 \cdot 3}{2} = 67,5$

$\phi_3 = \frac{30 \cdot 3}{2} = 45$

$v_0 = \frac{\bar{M}_0}{EJ} = \frac{281,25 \cdot 10^{-3}}{37,7} = \underline{\underline{7,46 \cdot 10^{-3} \text{ m}}}$

$\varphi_1 = \frac{\bar{M}_1}{EJ} = \frac{52,5 - 45 - 67,5}{37,7 \cdot 10^3} = \underline{\underline{-1,591 \cdot 10^{-3} \text{ rad}}}$

$\varphi_2 = \frac{\bar{M}_2}{EJ} = \frac{52,5 \cdot 10^3}{37,7} = \underline{\underline{1,393 \cdot 10^{-3} \text{ rad}}}$

e)

