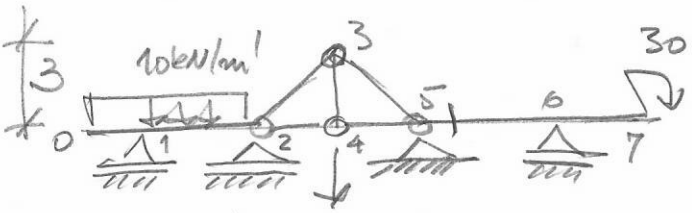
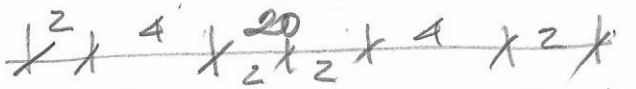
UNIVERZITET U BANJALUCI
ARHITEKTONSKO GRAĐEVINSKO GEODETSKI FAKULTET
KATEDRA ZA MEHANIKU I TEORIJU KONSTRUKCIJA
STUDIJSKI PROGRAM ARHITEKTURA

05.09.2020

MEHANIKA I OTPORNOST MATERIJALA





ZA NOSAČ I OPTEREĆENJE NA SKICI TREBA:

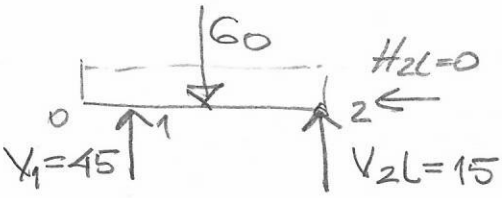
a) ODREDITI REAKCIJE OSLONACA I SILE VEZA

b) NACRTATI DIJAGRAME SILA U PRESEKU NA PUNOM DELU NOSAČA

c) ODREDITI SILE U ŠTAPOVIMA REŠETKE PO VOLJI DVE METODE

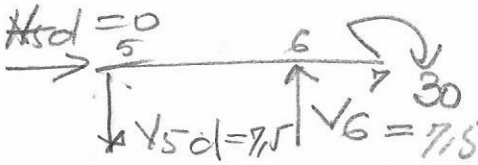
d) SRAČUNATI I NACRTATI DIJAGRAME KOMPONENTALNIH NAPONA U PRESEKU 5 DESNO AKO JE PRESEK PRAVOUGAONI $b/h = 20/40$ cm OD MATERIJALA SA $E = 30$ GPa

e) MOR-MAKSVELOVOM ANALOGIJOM ODREDITI v_7, φ_6 I SKICIRATI DEF. OSU NOSAČA NA DELU 5-6-7



$\Sigma M_{2L} = 60 \cdot 3 - V_1 \cdot 4 = 0 \quad V_1 = 45\,kN$

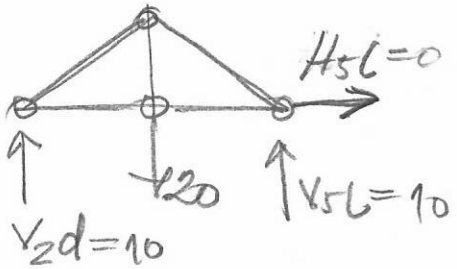
$\Sigma V = 45 - 60 + V_{2L} = 0 \quad V_{2L} = 15\,kN$



$\Sigma M_{5d} = 4V_6 - 30 = 0 \quad V_6 = 7,5\,kN$

$\Sigma V = V_{5d} \cdot 4 - 30 = 0 \quad V_{5d} = 7,5\,kN$

$\Sigma H = H_{5d} = 0 \quad H_{5d} = 0$



$\Sigma H = H_{5L} = 0 \quad H_{5L} = 0$

$\Sigma M_5 = 20 \cdot 2 - 4V_d = 0 \quad V_d = 10\,kN$

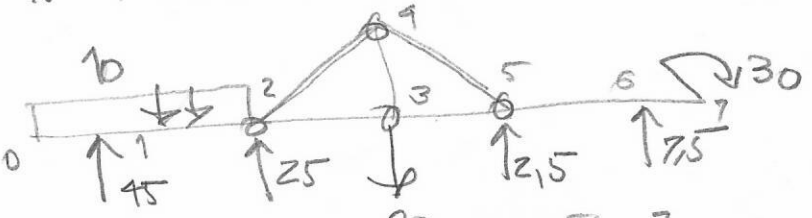
$\Sigma M_2 = 20 \cdot 2 - 4V_{5L} = 0 \quad V_{5L} = 10\,kN$

$V_2 = V_{2L} + V_{2d} = 15 + 10 = 25\,kN$

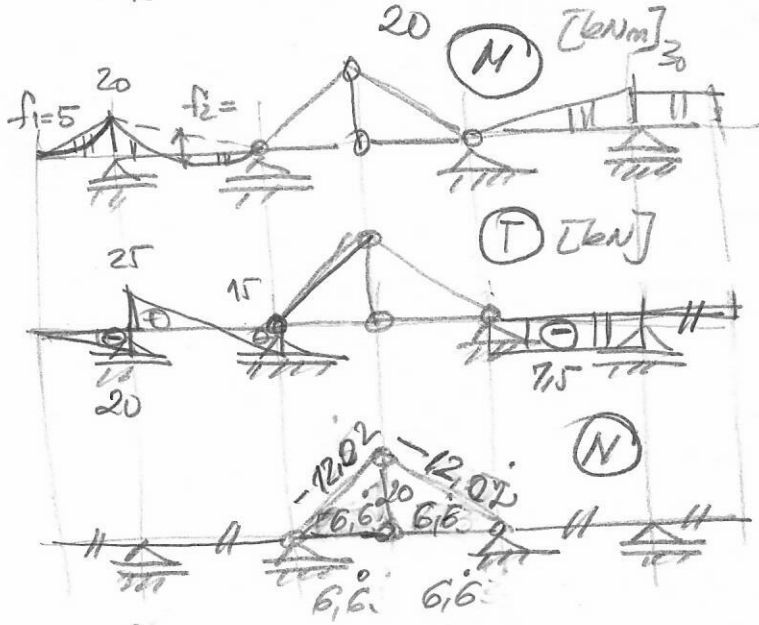
$V_5 = V_{5L} - V_{5d} = 10 - 7,5 = 2,5\,kN$

$f_1 = 10 \cdot \frac{2}{8} = 5$

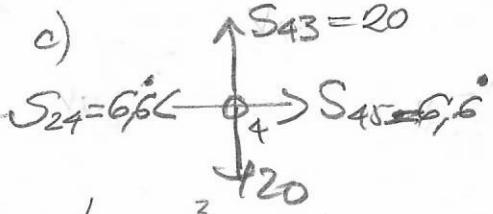
$f_2 = 10 \cdot \frac{4}{8} = 20$



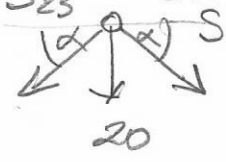
b)



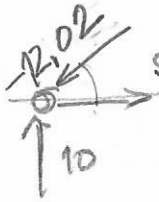
c)



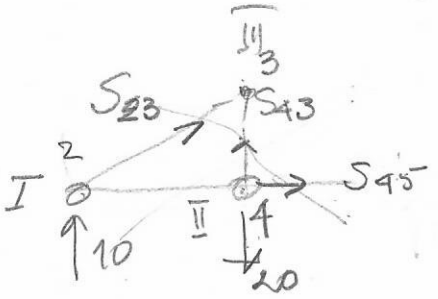
$tg\alpha = \frac{3}{2} \quad \sin\alpha = 0,832 \quad \cos\alpha = 0,555$



$S_{23} = S_{35} = \frac{-20}{2 \cdot 0,832} = -12,02$



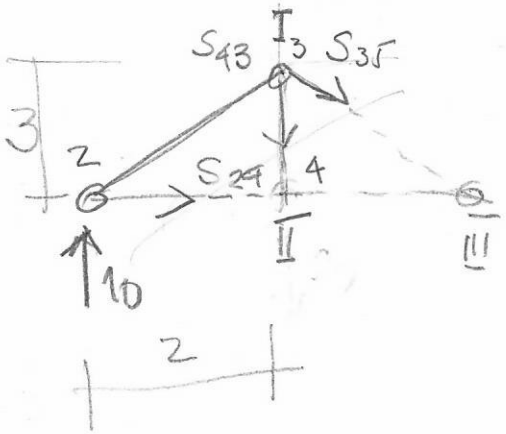
$S_{24} = 12,02 \cdot 0,555 = 6,6$



$\Sigma M_I = 2(S_{43} - 20) = 0$ $\quad S_{43} = 20\ kN$ ✓

$\Sigma M_{II} = 2(10 + 0{,}832 \cdot S_{23}) = 0$ $\quad S_{23} = -12{,}02\ kN$

$\Sigma M_{III} = 3S_{45} - 2 \cdot 10 = 0$ $\quad S_{45} = 6{,}6\dot{6}\ kN$



$\Sigma M_I = 3 \cdot S_{24} - 2 \cdot 10 = 0$ $\quad S_{24} = 6{,}6\dot{6}\ kN$

$\Sigma M_{II} - 3 \cdot 0{,}555 S_{35} + 2 \cdot 10 = 0$ $\quad S_{35} = 12{,}02\ kN$

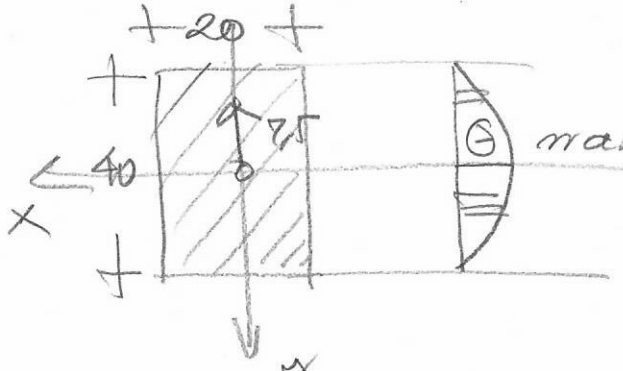
$\Sigma M_{III} = 2 \cdot S_{24} - 4 \cdot 10 = 0$ $\quad S_{24} = 20\ kN$

d) $M_{Sd} = 0$

$T_{Sd} = -7{,}5\ kN$

$F = 20 \cdot 40 = 800\ cm^2$

$\max \tau = \frac{3}{2} \frac{-7{,}5 \cdot 10^{-3}}{800 \cdot 10^{-4}} = 0{,}141\ MPa$

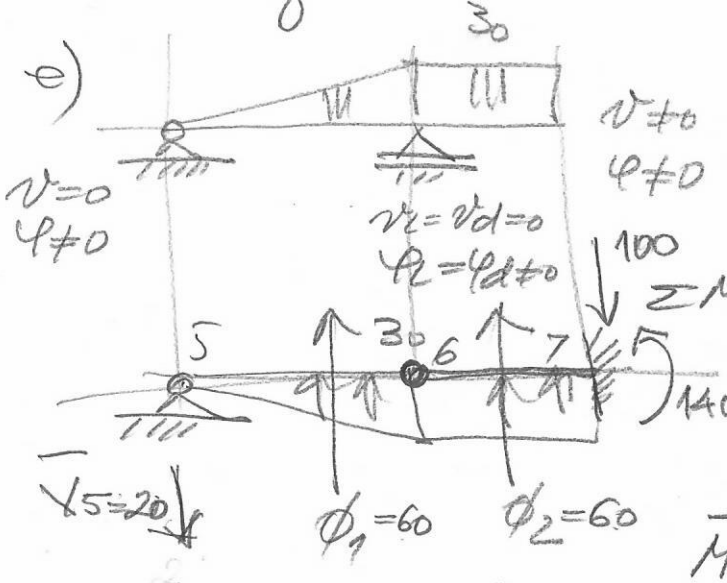


$J_x = \frac{20 \cdot 40^3}{12} = 106666{,}6\ cm^4$

$EJ = 30 \cdot 10^3 \cdot 106666{,}6 \cdot 10^{-8}$

$EJ = 32\ MNm^2$

e)



$\phi_1 = \frac{30 \cdot 4}{2} = 60$

$\phi_2 = 30 \cdot 2 = 60$

$\Sigma M_6 C = 4\bar{V}_5 - 60 \cdot \frac{1}{3} = 0$

$\bar{V}_5 = 20$

$\bar{T}_6 = 60 - 20 = 40$

$\bar{M}_7 = -60 \cdot 1 + 100 \cdot 2 = -140$

$\varphi_6 = \frac{\bar{T}_6}{EJ} = \frac{40 \cdot 10^{-3}}{32} = 1{,}25 \cdot 10^{-3}\ rad$

$v_7 = \frac{\bar{M}_7}{EJ} = \frac{140 \cdot 10^{-3}}{32} = 4{,}375 \cdot 10^{-3}\ m$