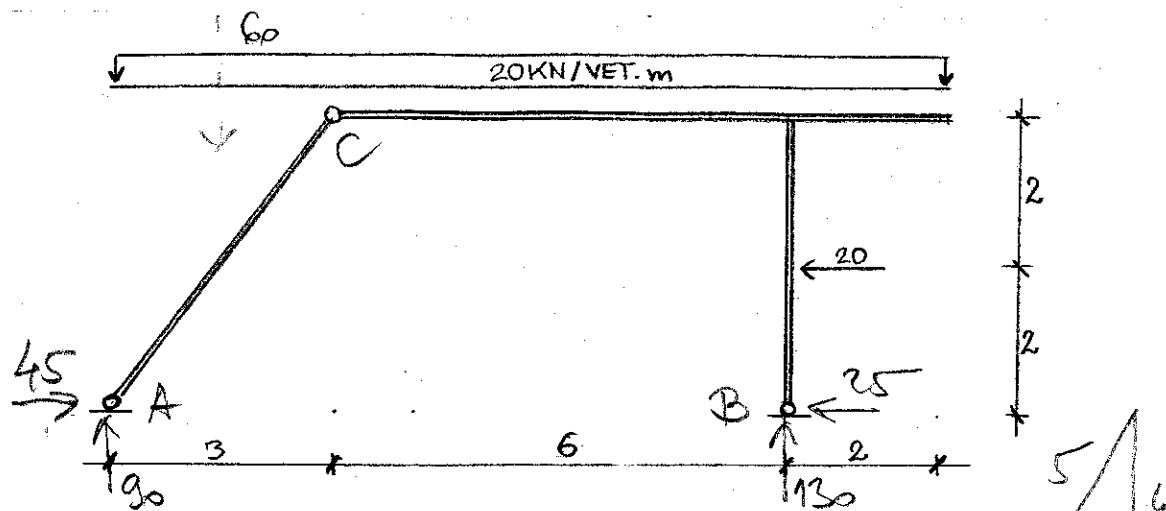


3.) Rajzolja meg az adott tartó részletesen kótázott belsőerő ábráit a megadott tengelyvonalak felhasználásával! Ügyeljen az előjelekre, a szükséges metszések, belógások, szélsőértékek feltüntetésére!

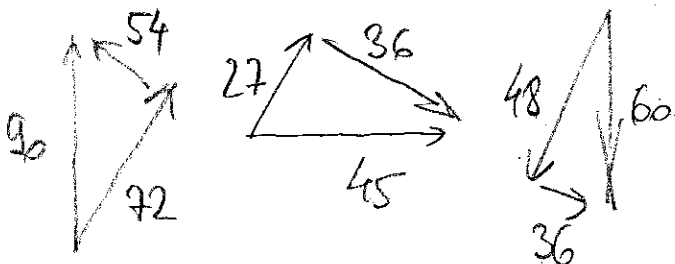


$$\sum M_A = 0 \quad \left(\frac{20 \cdot 11^2}{2} - 20 \cdot 2 \right) / 9 = B_y = 130 \uparrow$$

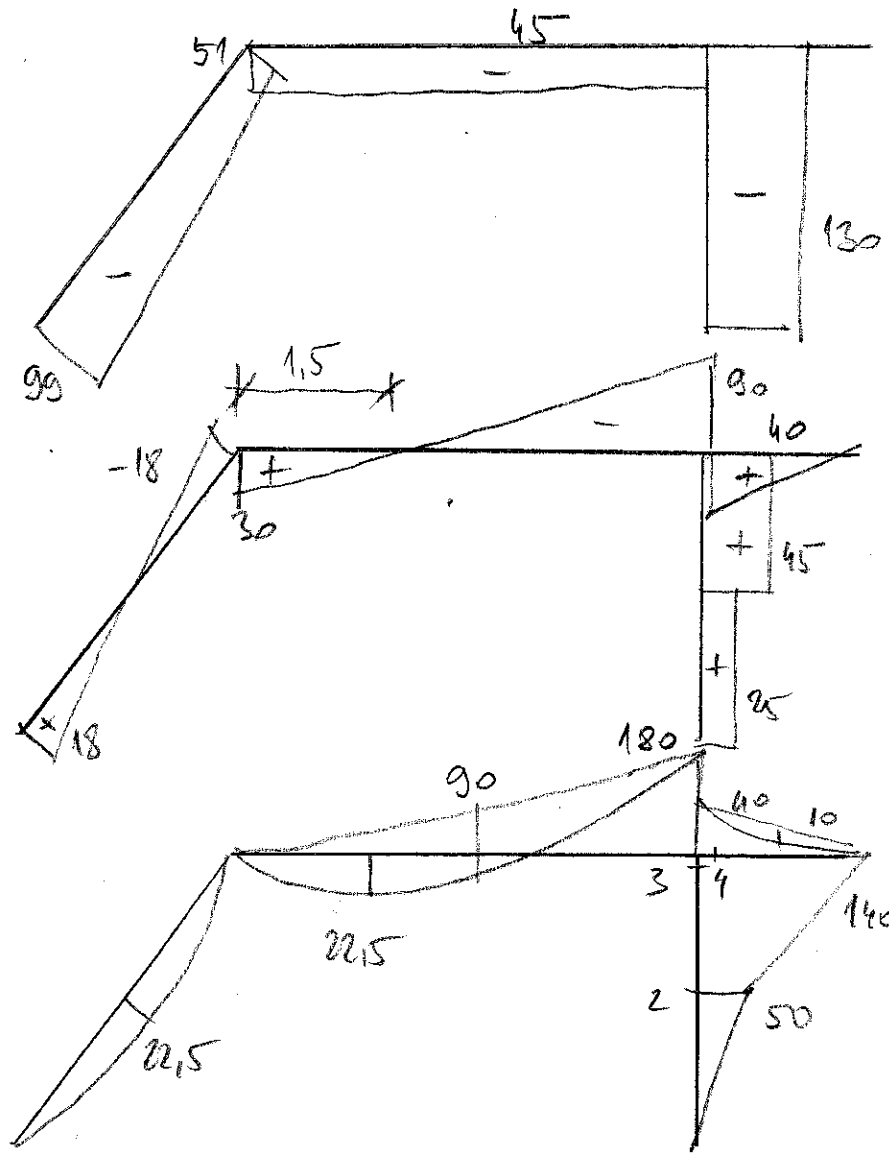
$$\sum M_B = 0 \quad \left(\frac{20 \cdot 9^2}{2} + 20 \cdot 2 - \frac{20 \cdot 2^2}{2} \right) / 9 = A_y = 90 \uparrow$$

$$\sum M_C^b = \left(90 \cdot 3 - \frac{2 \cdot 20}{2} \right) / 4 = A_x = 45 \rightarrow$$

$$\sum M_C^j = \left(130 \cdot 6 - \frac{20 \cdot 8^2}{2} - 20 \cdot 2 \right) / 4 = 25 \leftarrow$$



N



$$N_1 = 72 + 27 = 99$$

$$N_2 = 99 - 48 = 51$$

$$T_1 = 54 - 36 = 18$$

$$T_2 = 18 - 36 = -18$$

(5)

II

(10)

III

(15)

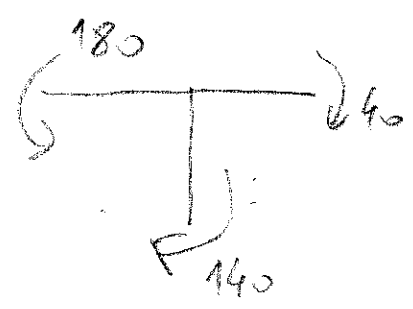
(30)

$$M_{1max} = \frac{20 \cdot 32}{8} = 22,5 (=6)$$

$$M_{2max} = \frac{30^2}{2 \cdot 20} = 22,5 \quad b_2 = \frac{20 \cdot 6^2}{8} = 90$$

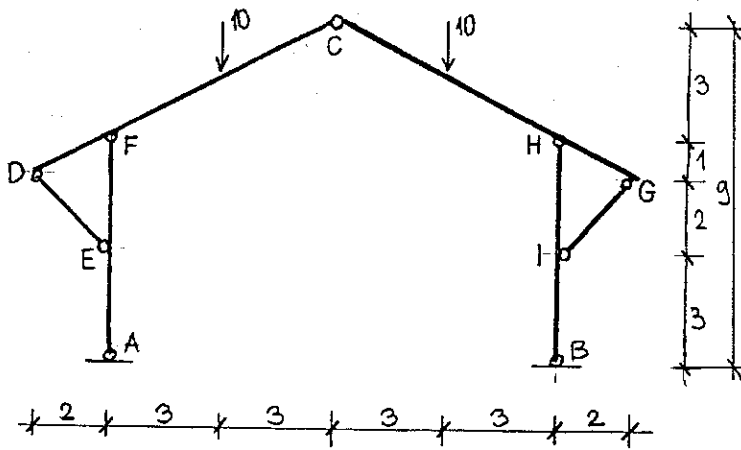
$$M_2 = 25 \cdot 2 = 50 \quad M_3 = 25 \cdot 4 + 20 \cdot 2 = 140$$

$$M_4 = \frac{20 \cdot 2^2}{2} = 40 \quad b = \frac{40}{4} = 10$$

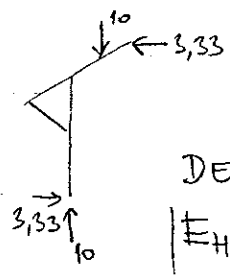


3.)

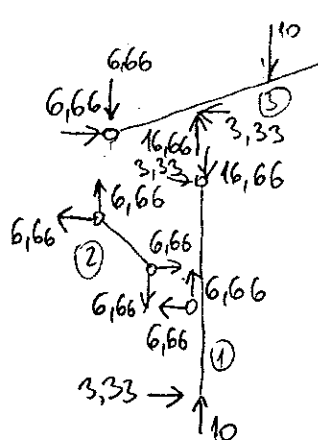
3. Alf / 2002



$A_v = B_v = 10$
 $\sum M_C = 0$
 $(10 \cdot 6 - 10 \cdot 9) / 9 = A_H = 3,33 \rightarrow$
 $B_H = 3,33 \leftarrow$



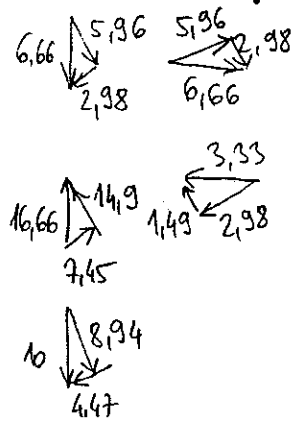
DE mid 45°
 $|E_H| = |E_V|$



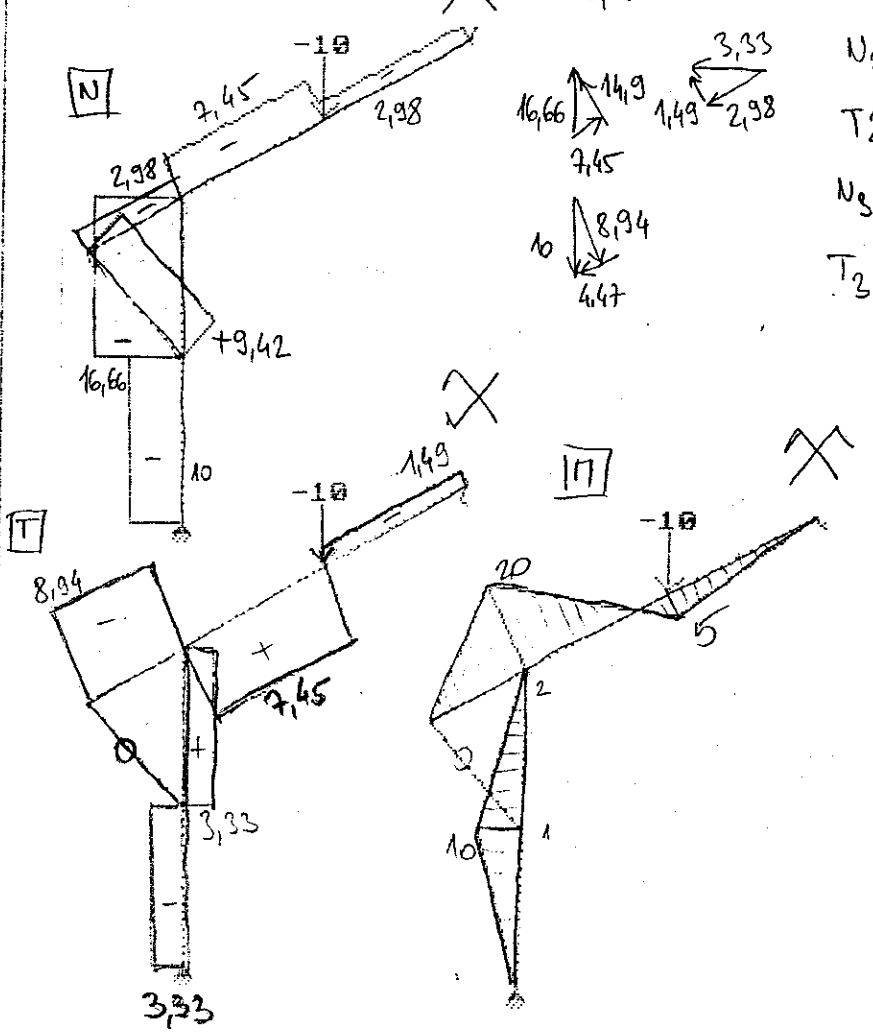
$\sum M_F = 0$

$-3,33 \cdot 6 + E_H \cdot 3 = 0 \Rightarrow E_H = E_V = 6,66 \quad E = 9,42 \text{ kN (+)}$

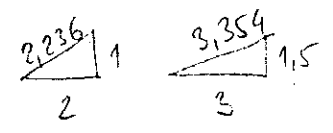
A köbbsi vektorek egyenlítőjéből kétszer szelődható.



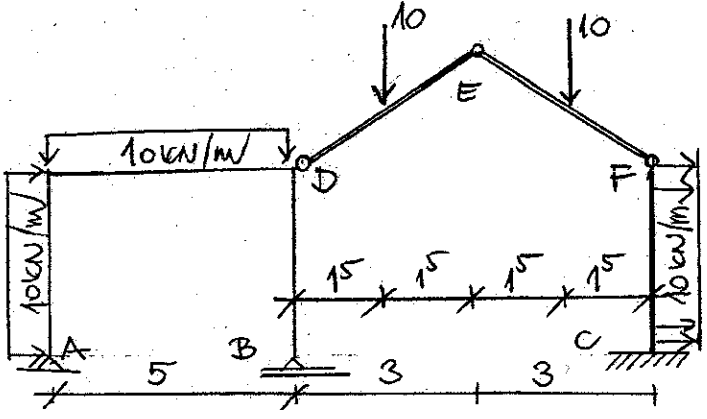
$N_1 = 5,96 - 2,98 = 2,98$
 $T_1 = 5,96 + 2,98 = 8,94$
 $N_2 = 2,98 - 7,45 + 2,98 = 7,45 \ominus$
 $T_2 = 14,9 - 8,94 + 1,49 = 7,45$
 $N_3 = 7,45 - 4,47 = 2,98$
 $T_3 = 7,45 - 8,94 = 1,49$



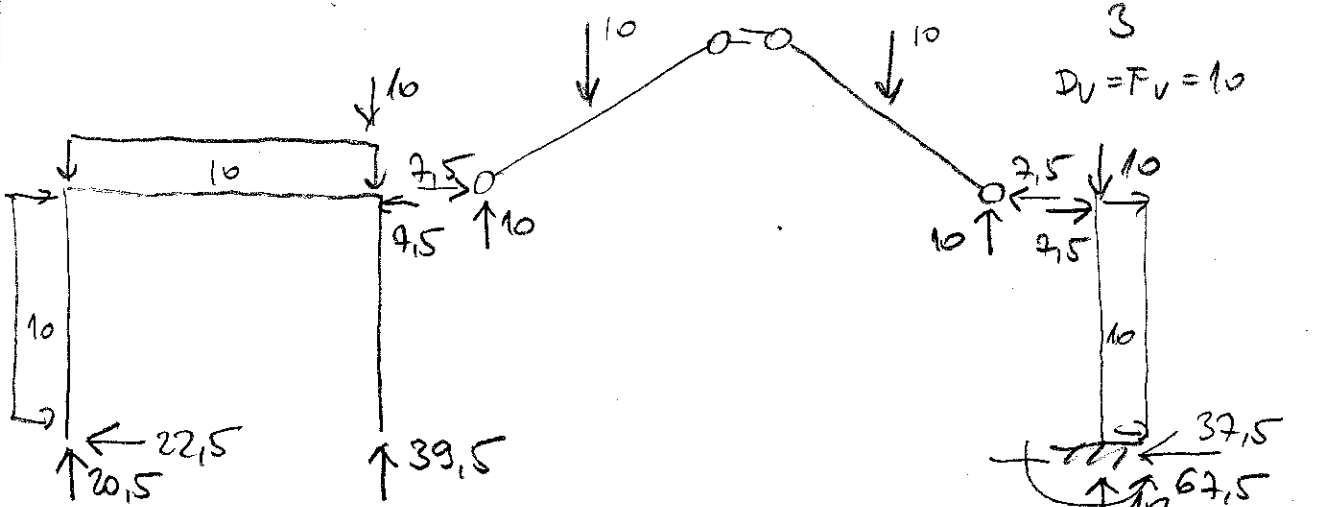
$M_1 = 3,33 \cdot 3 = 10 \text{ kNm}$
 $M_2 = 8,94 \cdot 2,236 = 20 \text{ kNm}$
 $M_3 = 3,354 \cdot 1,49 = 5 \text{ kNm}$



(B)



2.) Határozza meg az alábbi tartó támasz és csuklóerőit. Rajzolja meg az ún. robbantott szerkezeti ábrát. Rajzolja meg a részletesen kótázott belsőerőábrákat. Ügyeljen a szélsőértékek, ugrások, törések, belógások kiszámítására és feltüntetésére. Csak a részletesen dokumentált számításokat tudjuk elfogadni.



$$\sum M_E = 0 \quad (10 \cdot 3 - 10 \cdot 1,5) / 2 = D_H = 7,5$$

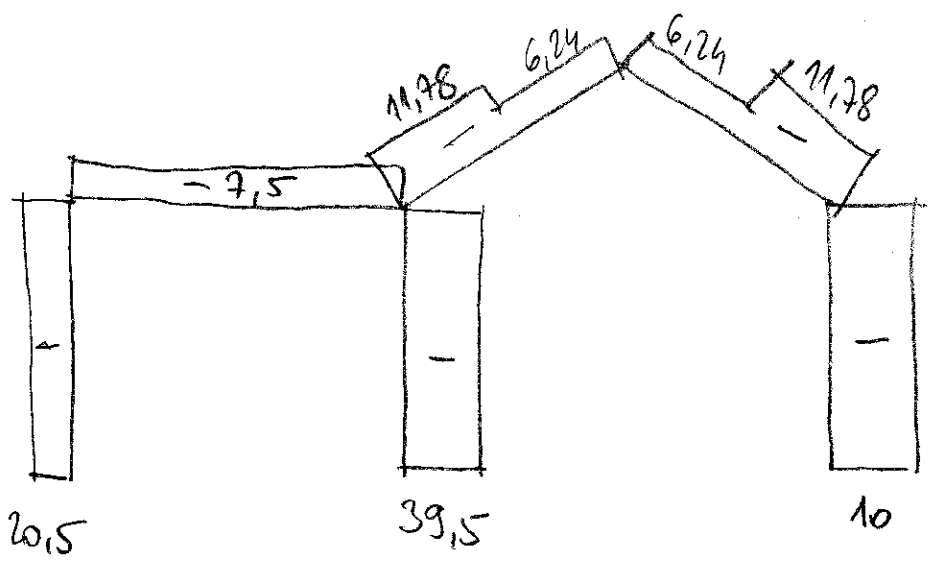
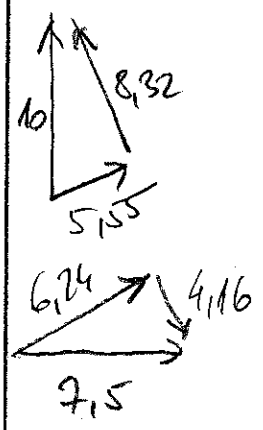
$$\sum M_A = 0 \quad \left(\frac{10 \cdot 3^2}{2} + \frac{10 \cdot 5^2}{2} + 10 \cdot 5 - 7,5 \cdot 3 \right) / 15 = B_V = 39,5$$

$$\sum M_B = 0 \quad \left(\frac{10 \cdot 5^2}{2} - \frac{10 \cdot 3^2}{2} + 7,5 \cdot 3 \right) / 5 = A_V = 20,5$$

$$\sum M_C = 0 \quad 5 \cdot 10 + 10 - 39,5 - 7,5 = 0$$

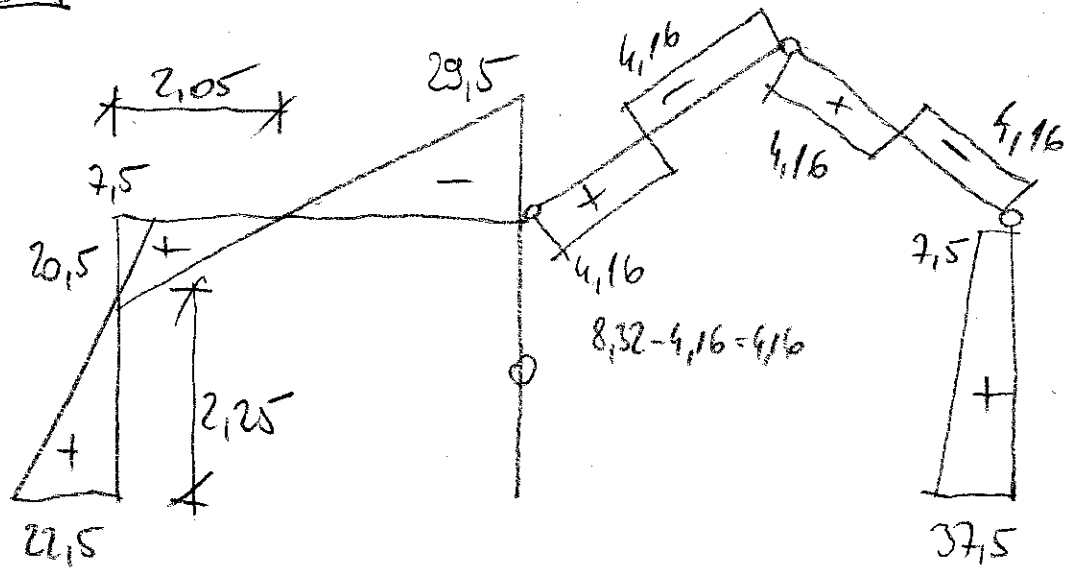
$$C_H = 30 + 7,5 = 37,5 \quad \sum M_C = 7,5 \cdot 3 + 10 \cdot 3^2 / 2 = 67,5$$

(N)

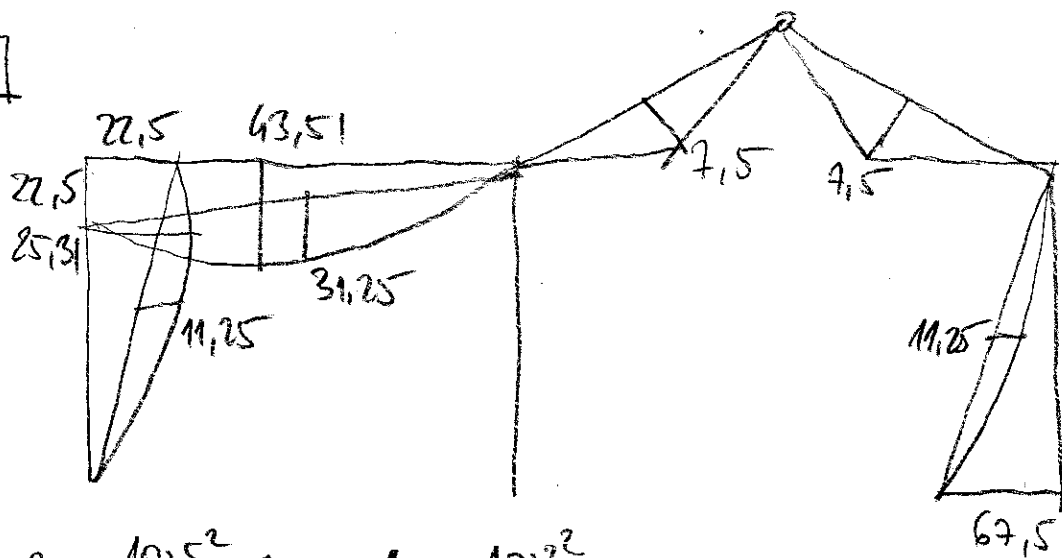


T

8



M

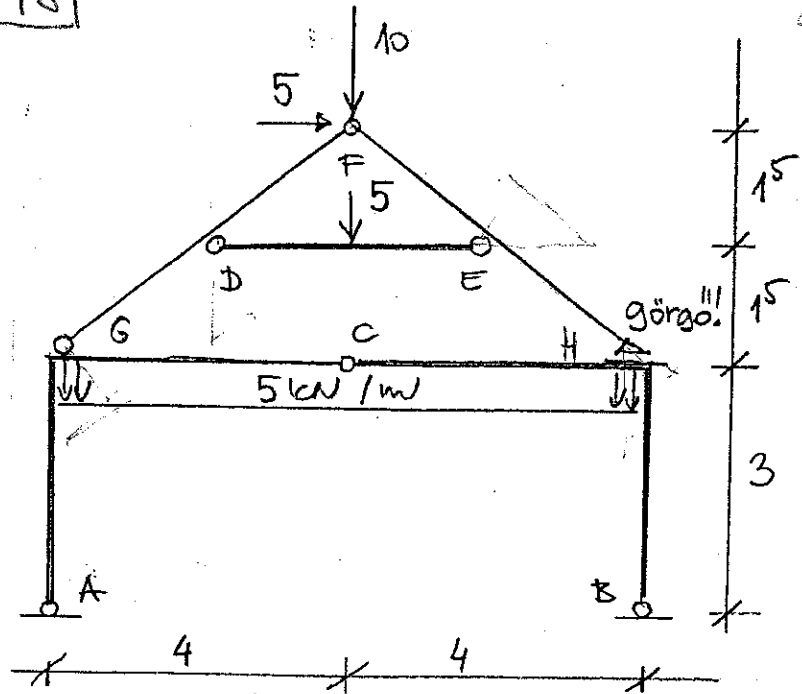


$$b_1 = \frac{10 \cdot 5^2}{8} = 31,25 \quad b_2 = \frac{10 \cdot 3^2}{8} = 11,25$$

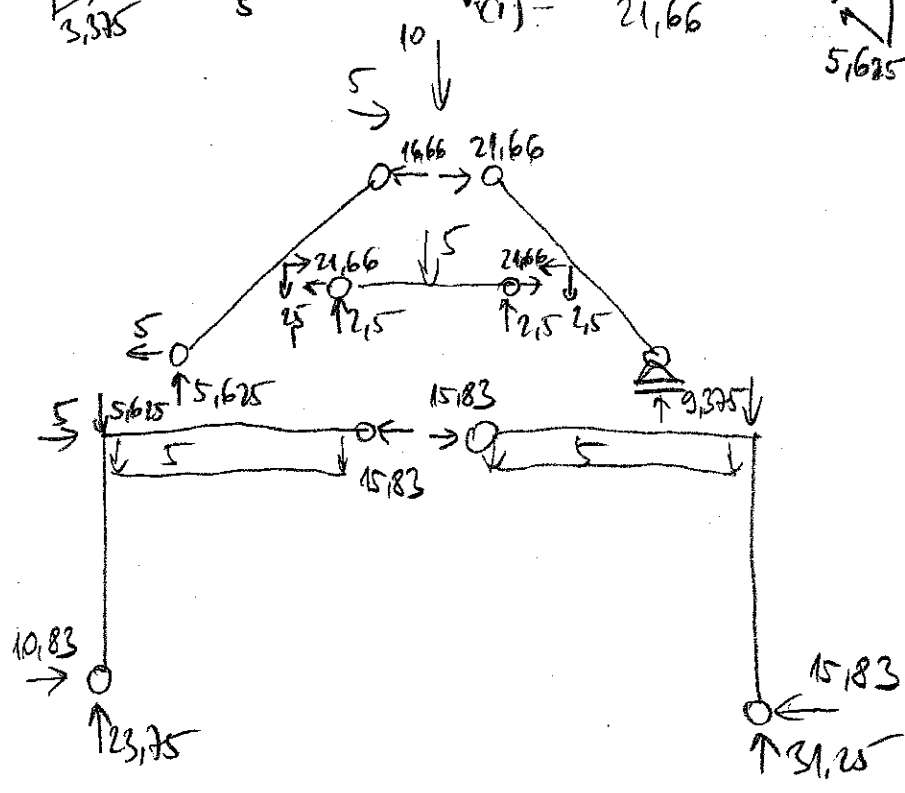
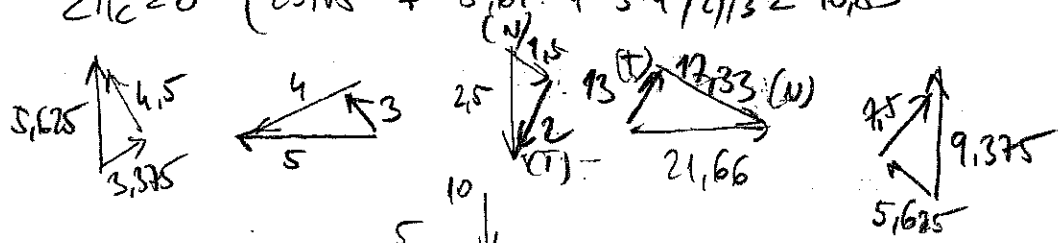
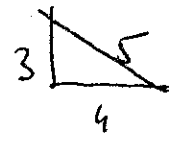
$$M_1 = \frac{P \cdot l}{4} = \frac{10 \cdot 3}{4} = 7,5 \quad M_2 = 22,5 \cdot 3 - \frac{10 \cdot 3^2}{2} = 22,5$$

$$M_{1max} = \frac{22,5^2}{2 \cdot 10} = 25,31 \quad M_{2max} = \frac{20,5^2}{2 \cdot 10} + 22,5 = 43,51$$

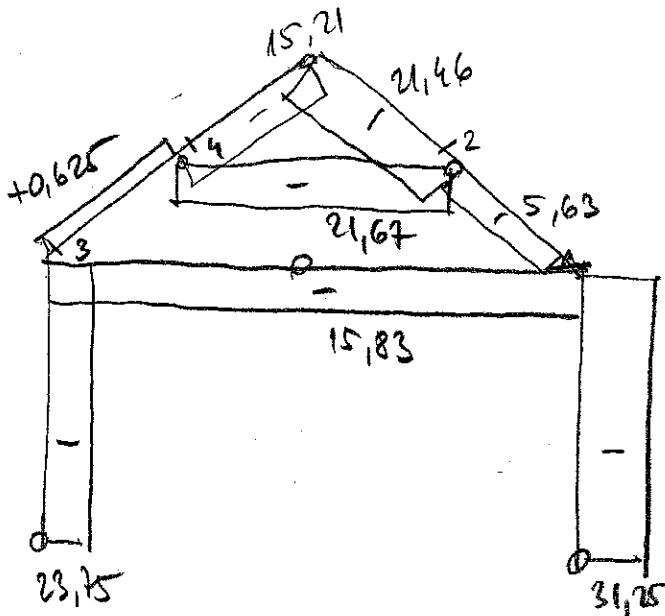
1.)



$$\begin{aligned} \sum M_G = 0 & \quad (10 \cdot 4 + 5 \cdot 3 + 5 \cdot 4) / 8 = 9,375 \quad \left. \begin{array}{l} \\ \\ \end{array} \right\} 15 \checkmark \\ \sum M_H = 0 & \quad (15 \cdot 4 - 5 \cdot 3) / 8 = 5,625 \\ \sum M_F = 0 & \quad (9,375 \cdot 4 - 2,5 \cdot 2) / 1,5 = 21,66 \\ \sum M_B = 0 & \quad (5 \cdot 8^2 / 2 + 5,625 \cdot 8 - 5 \cdot 3) / 8 = 23,75 = A_V \\ \sum M_A = 0 & \quad (5 \cdot 8^2 / 2 + 9,375 \cdot 8 + 5 \cdot 3) / 8 = \\ \sum M_C = 0 & \quad (23,75 \cdot 4 - 5,625 \cdot 4 - 5 \cdot 4^2 / 2) / 3 = 10,83 \end{aligned}$$



N

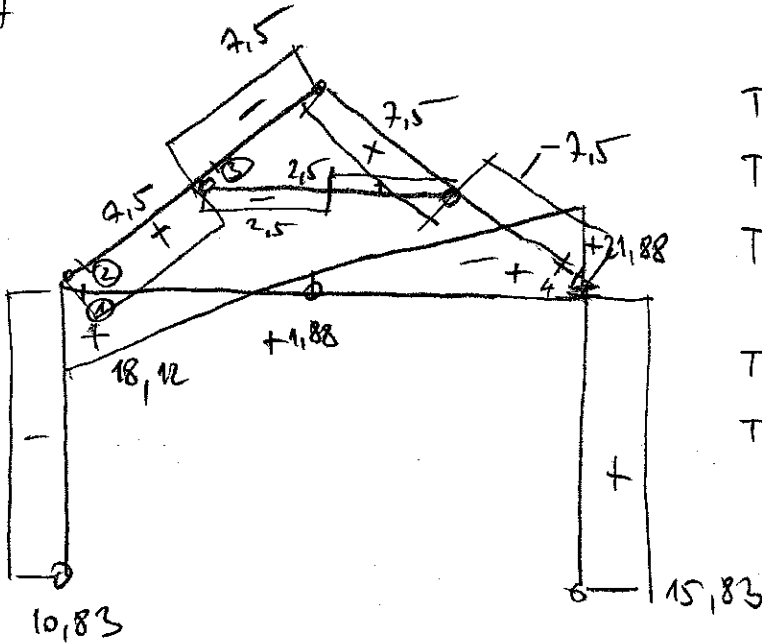


$$N_2 = -5.63 - 17.33 + 1.5 = -21.46$$

$$N_3 = -3.375 + 4 = 0.625 (+)$$

$$N_4 = 0.625 + 1.5 - 17.33 = -15.21$$

T



$$T_1 = 23.75 - 5.625 =$$

$$T_2 = 4.5 + 3 = 7.5$$

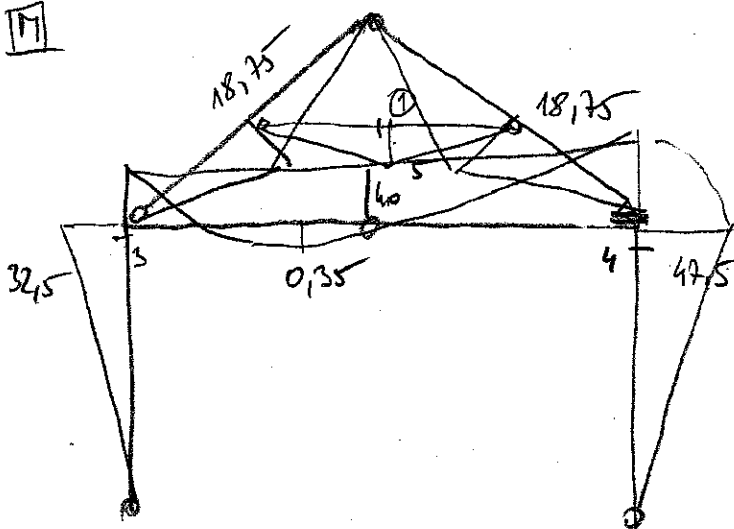
$$T_3 = 7.5 - 2 - 13 = 7.5 (-)$$

15 (up/down)

$$T_4 = 7.5 (-)$$

$$T_5 = 7.5 (+)$$

M



$$M_1 = \frac{5 \cdot 4}{4} = 5$$

$$M_2 = \frac{15 \cdot 5}{4} = 18.75 \quad (15 = T_{up/down})$$

$$M_3 = 10.83 \cdot 3 = 32.5$$

$$M_4 = 15.83 \cdot 3 = 47.5$$

$$b = \frac{5 \cdot 8^2}{8} = 40$$

$$M_{max} = \frac{1.88^2}{2 \cdot 5} = 0.35$$