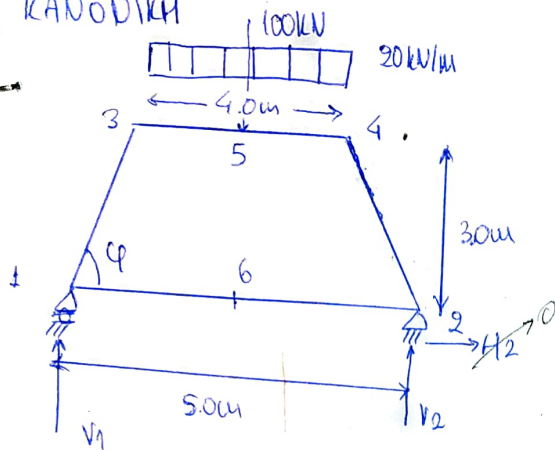


202) ΚΑΝΟΝΙΚΗ



$$\varphi = \arctan\left(\frac{3}{0.5}\right) = 80,54^\circ$$

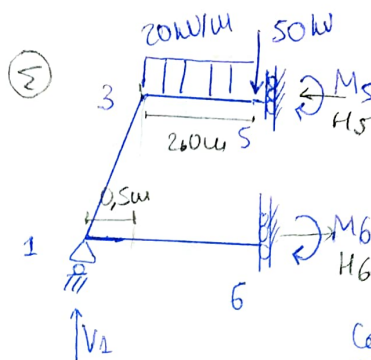
$$+\uparrow \sum F_y = 0 \Rightarrow V_1 = 90 \text{ kN} \uparrow$$

$$\circlearrowleft \sum M_1 = 0 \Rightarrow 20 \times 2 \times 1,5 + 50 \times 1,5 - H_5 \times 3 = 0 \Rightarrow H_5 = 61,667 \text{ kN} \leftarrow$$

$$\rightarrow \sum F_x = 0 \Rightarrow H_6 = 61,667 \text{ kN} \rightarrow$$

$$\sum F_x = 0 \Rightarrow H_2 = 0$$

ορα 60 κκετρικών γοπέας $n=3$?

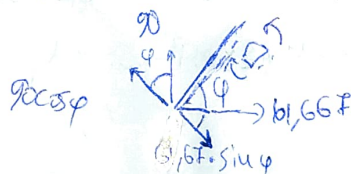


$$n=2$$

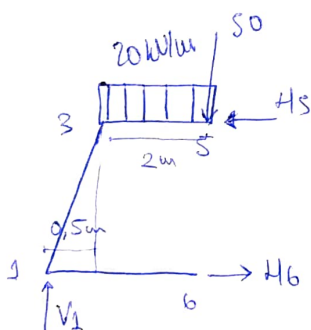
$$\cos \varphi = 0,164$$

$$\sin \varphi = 0,986$$

$$l_{13} = \sqrt{3^2 + 0,5^2} = 3,041 \text{ m}$$

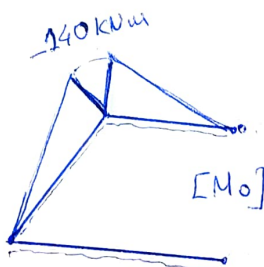


$$I = 30000 \times 10^{-8} = 3 \times 10^{-4} \text{ m}^4$$

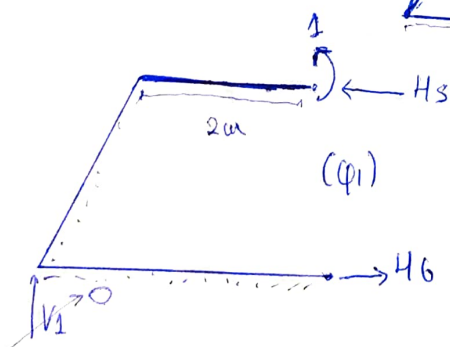


(φ₀)

$$M_3 = 90 \cos \varphi \times 3,041 - 61,67 \times 0,986 \times 3,041 = -140$$



[M₀]

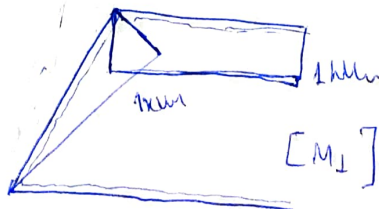


(φ₁)

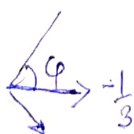
$$+\uparrow \sum F_y = 0 \Rightarrow V_1 = 0$$

$$\circlearrowleft \sum M_1 = 0 \Rightarrow -1 \cdot H_5 \times 3 \Rightarrow H_5 = -1/3 \text{ kN}$$

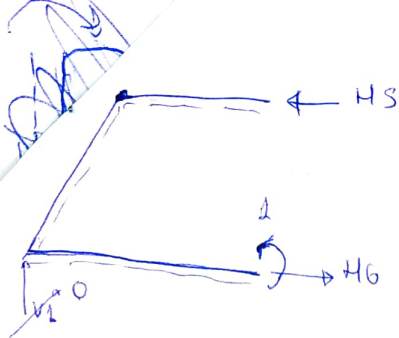
$$\rightarrow \sum F_x = 0 \Rightarrow H_6 = -1/3 \text{ kN}$$



[M₁]



$$M_3 + \frac{1}{3} \sin \varphi \times 3,041 = 1 \text{ kNm}$$



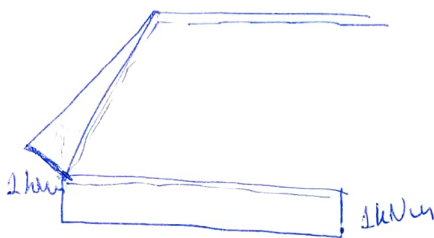
(42)

$$+\uparrow \sum F_y = 0 \Rightarrow H_1 = 0$$

$$+\circlearrowleft \sum M_1 = 0 \Rightarrow$$

$$-1 - 3H_5 = 0 \Rightarrow H_5 = -1/3 \text{ kN} \rightarrow$$

$$+\rightarrow \sum F_x = 0 \Rightarrow H_6 = -1/3 \text{ kN} \leftarrow$$



(M2)



$$M_3 = -1 + \frac{1}{3} \sin \varphi 3,041$$



$$F_{10} = \int \frac{M_1 M_0}{EI} dx = - \frac{281,9}{EI} = \frac{-281,9}{21 \times 3 \times 10^4} = -4,475 \times 10^{-3}$$

$$\triangle \times \triangle = \frac{140}{EI} \times \frac{1}{3} \times (-140) \times 1 = - \frac{141,9}{EI}$$

$$\triangle \times \square = \frac{2}{EI} \times \frac{1}{2} \times (-140) \times 1 = - \frac{140}{EI}$$

$$F_{11} = \int \frac{M_1 M_1}{EI} dx = \frac{3,014}{EI} = 4,7836 \times 10^{-5}$$

$$\triangle \times \triangle = \frac{1}{3} \times \frac{3,041}{EI} \times 1^2 = \frac{1,014}{EI}$$

$$\square \times \square = 1^2 \times 2 = \frac{2}{EI}$$

$$F_{12} = F_{21} = \int \frac{M_1 M_2}{EI} dx = -8,04497 \times 10^{-6}$$

$$\triangle \times \triangle = \frac{1}{6} \times (-1) \times (1) \times \frac{3,041}{EI} = -0,5068 \frac{1}{EI}$$

$$F_{20} = \int \frac{M_2 M_0}{EI} dx = 1,1259 \times 10^{-3}$$

$$\triangle \times \triangle = \frac{1}{6} \times (-140) \times (-1) \times \frac{3,041}{EI} =$$

$$2 \int \frac{M_2 M_2}{EI} dx = \frac{3,01367}{EI} = 4,7836 \times 10^{-5}$$

$$\begin{aligned} -1 \times \frac{1}{3} \times (-1)^2 \times \frac{3,041}{EI} &= \\ 1 \times \frac{1}{3} \times 1^2 \times \frac{2}{EI} &= \end{aligned}$$

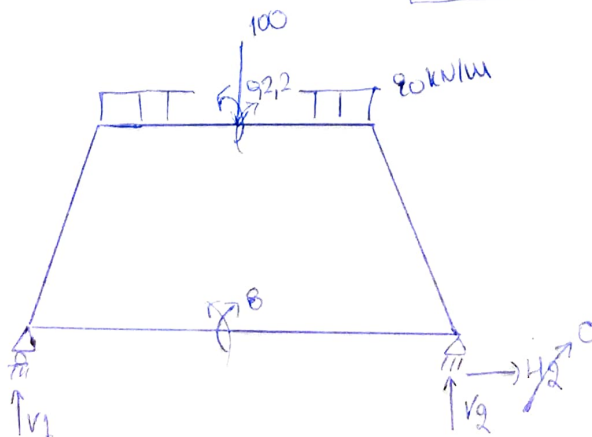
$$\left. \begin{aligned} F_{10} + F_{11}x_1 + F_{12}x_2 &= 0 \\ F_{20} + F_{21}x_1 + F_{22}x_2 &= 0 \end{aligned} \right\} \Rightarrow$$

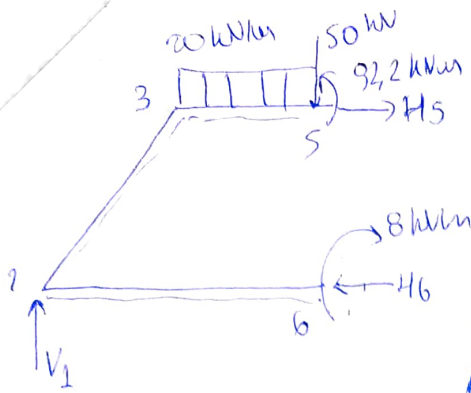
$$\left. \begin{aligned} -4,475 \times 10^{-3} + 4,7836 \times 10^{-5} \cdot x_1 - 8,045 \cdot 10^{-6} \cdot x_2 &= 0 \\ 4,4259 \times 10^{-3} - 8,045 \cdot 10^{-6} \cdot x_1 + 4,7836 \times 10^{-5} x_2 &= 0 \end{aligned} \right\} \begin{aligned} (\times 10^6) \\ (\times 10^6) \end{aligned}$$

$$\left. \begin{aligned} -4475 + 47,84 \cdot x_1 - 8,045 \cdot x_2 &= 0 \\ 4425,9 - 8,045 \cdot x_1 + 47,84 \cdot x_2 &= 0 \end{aligned} \right\} \begin{aligned} \Rightarrow \\ \left(\begin{aligned} \times 8,045 \\ 47,84 \end{aligned} \right) \end{aligned}$$

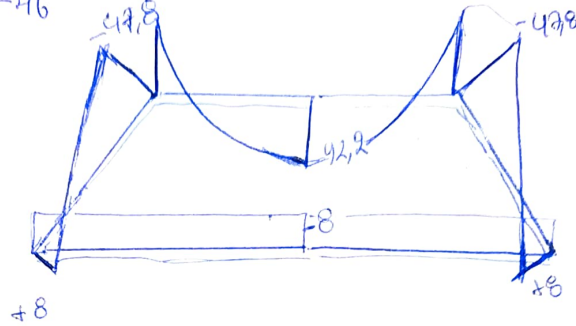
$$\left. \begin{aligned} -4475 + 47,84 \cdot x_1 - 8,045 \cdot x_2 &= 0 \\ 489,34 - 1,353 \cdot x_1 + 8,045 \cdot x_2 &= 0 \end{aligned} \right\} \Rightarrow$$

$$\begin{aligned} -4285,66 + 46,49 x_1 &= 0 \Rightarrow x_1 = 92,2 \text{ kNm} \\ x_2 &= -8,0 \text{ kNm} \end{aligned}$$



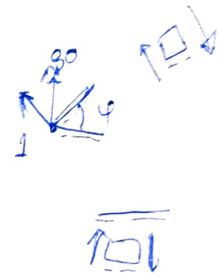


$$\begin{aligned} \sum F_x = 0 &\Rightarrow H_5 = H_6 = -33,6 \text{ kN} \\ \sum M_1 = 0 &\Rightarrow 20 \times 2 \times 1,5 + 50 \times 2,5 - 92,2 \times 8 + 3 H_5 \\ H_5 &= -33,6 \text{ kN} \\ \sum F_y = 0 &\Rightarrow V_1 = 90 \text{ kN} \uparrow \end{aligned}$$



[M]

$$M_3 = (90 \cos \varphi - 33,6 \sin \varphi) \times 3,04 + 8 = -47,8 \text{ kNm}$$

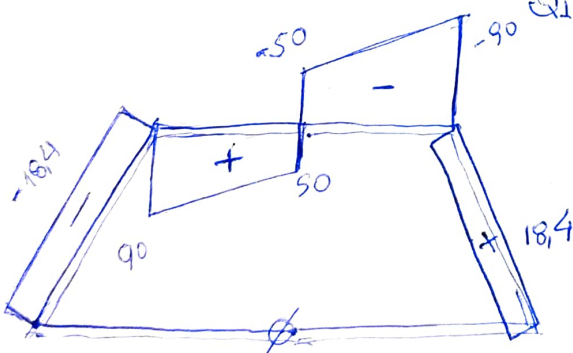


$$M_3 = 92,2 - 50 \times 2 - 20 \times 2 \times 1 = -47,8 \text{ kNm}$$

$$Q_{11} = 90 \cos \varphi = 14,8 - (33,6 \sin \varphi) = -18,4 \text{ kN}$$

$$Q_5 = 90 - 20 \times 2 = 50 \text{ kN}$$

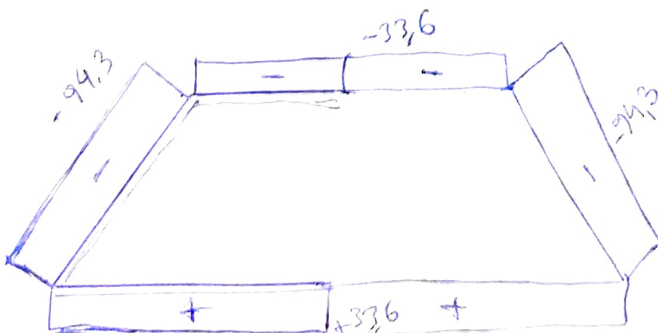
[Q]

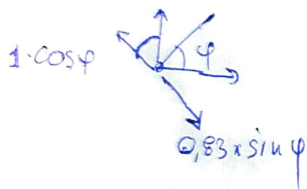
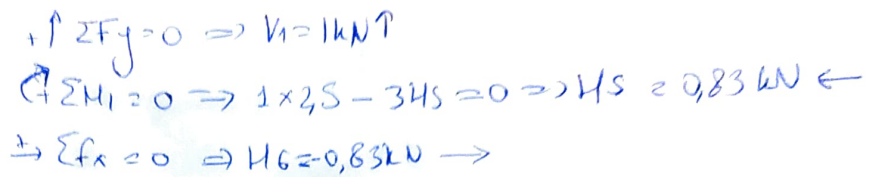
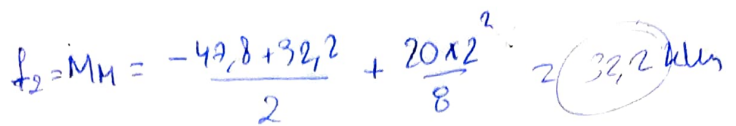


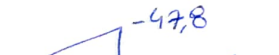
$$N_B = 90 \sin \varphi - 33,6 \cos \varphi = -94,3$$

$$N_5 = -33,6 \text{ kN}$$

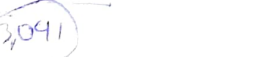
[N]






 $\times$

 $= \frac{1}{6} \times [8(2 \times 0 + (-2)) + (-47.8) \times (0 + 2(-2))]$


 $\times$

 $= \frac{1}{6} \times [8(-2) + (47.8)(-4)] =$


 $\times$

 $= 29.2 \times 3041 = 88.8$

$$= \frac{1}{6} (-47,8 \times (-2) + 2 \cdot 33,2(-2+0) + 92,2 \times 0) = -11,1$$