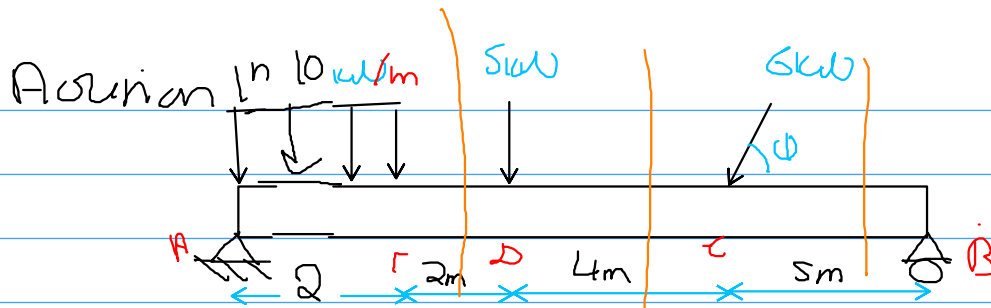
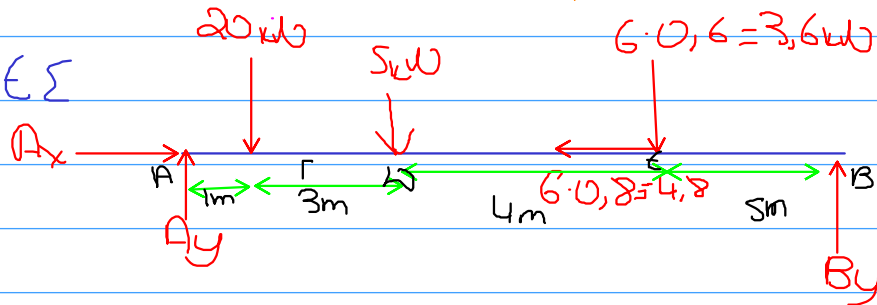


$$\cos \phi = 0,8$$

$$\sin \phi = 0,6$$



DES



Reaction due to UDL

$$F_y = F \cdot \sin \phi$$

$$F_x = F \cdot \cos \phi$$

$$Q = 10 \cdot 2 = 20 \text{ kN}$$

$$(\rightarrow) \sum F_x = 0$$

$$A_x - 4,8 = 0$$

$$A_x = 4,8 \text{ kN}$$

$$(\uparrow) \sum F_y = 0$$

$$A_y - 20 - 5 - 3,6 + B_y = 0$$

$$A_y + B_y = 28,6 \text{ (1)}$$

$$(\curvearrowright) \sum M_A = 0$$

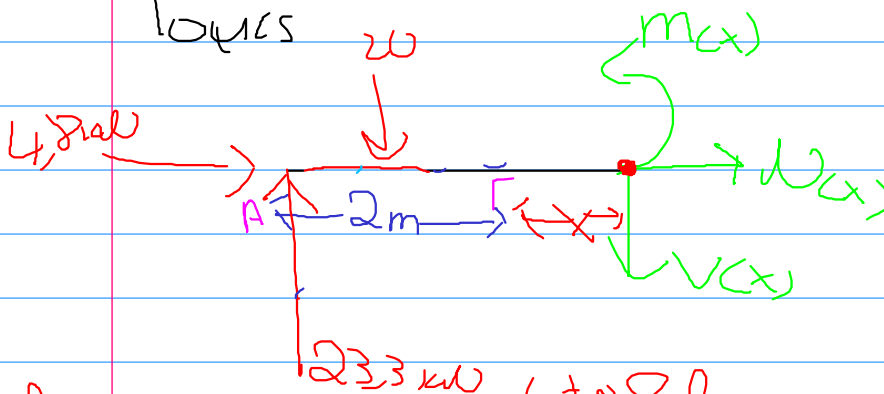
$$-20 \cdot 1 - 5 \cdot 4 - 3,6 \cdot 8 + 13 B_y = 0$$

$$\Rightarrow B_y = \frac{68,8}{13} = 5,29 \text{ kN}$$

$$\Rightarrow \textcircled{1} A_y + 5,29 = 28,6$$

$$A_y = 23,31 \text{ kN}$$

Shear



Shear Force Diagram

$$0,5 (x, 5,2 \text{ m})$$

$$\sum F_y = 0$$

$$23,3 - 20 - V(x) = 0$$

$$V(x) = 3,3 \text{ kN}$$

$$(\rightarrow) \sum F_x = 0$$

$$4,8 + H(x) = 0$$

$$H(x) = -4,8 \text{ kN}$$

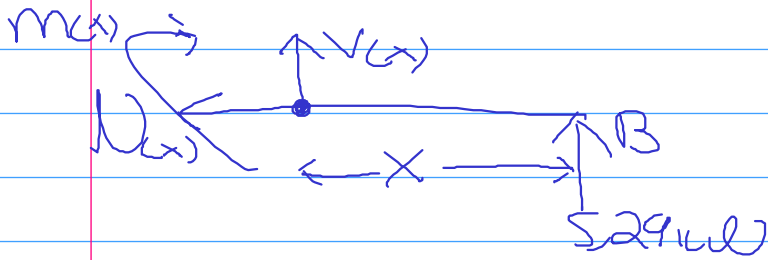
$$(\curvearrowright) \sum M_x = 0$$

$$M(x) - 23,3 \cdot (2+x) + 20(1+x) = 0$$

$$M(x=0) = 26,6 \text{ kNm}$$

$$M(x=2) = 33,2 \text{ kNm}$$

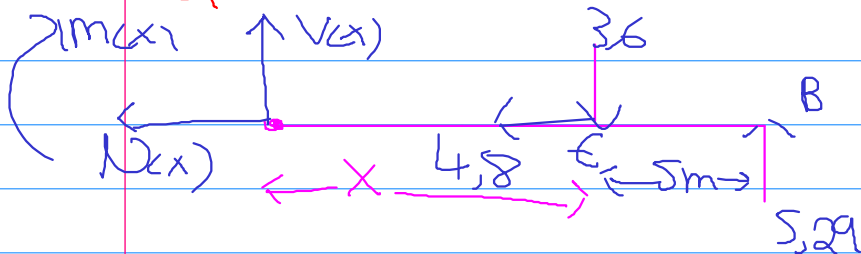
Travn $\in B$ $0 \leq x \leq 5(m)$



$$\begin{aligned} (\rightarrow) \sum F_x &= 0 & (+\uparrow) \sum F_y &= 0 \\ N(x) &= 0 & V(x) + 5,29 &= 0 \\ & & V(x) &= -5,29 \text{ kN} \end{aligned}$$

$$\begin{aligned} (\curvearrowright) \sum M_x &= 0 \\ -m(x) + 5,29x &= 0 \\ M(x) &= 5,29x \end{aligned}$$

Travn $\notin$ $0 \leq x \leq 4$



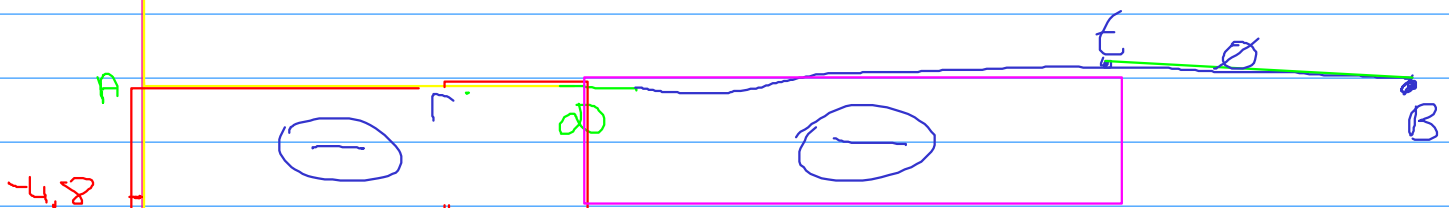
$$\begin{aligned} (\rightarrow) \sum F_x &= 0 \\ -N(x) - 4,8 &= 0 \\ N(x) &= -4,8 \text{ kN} \end{aligned}$$

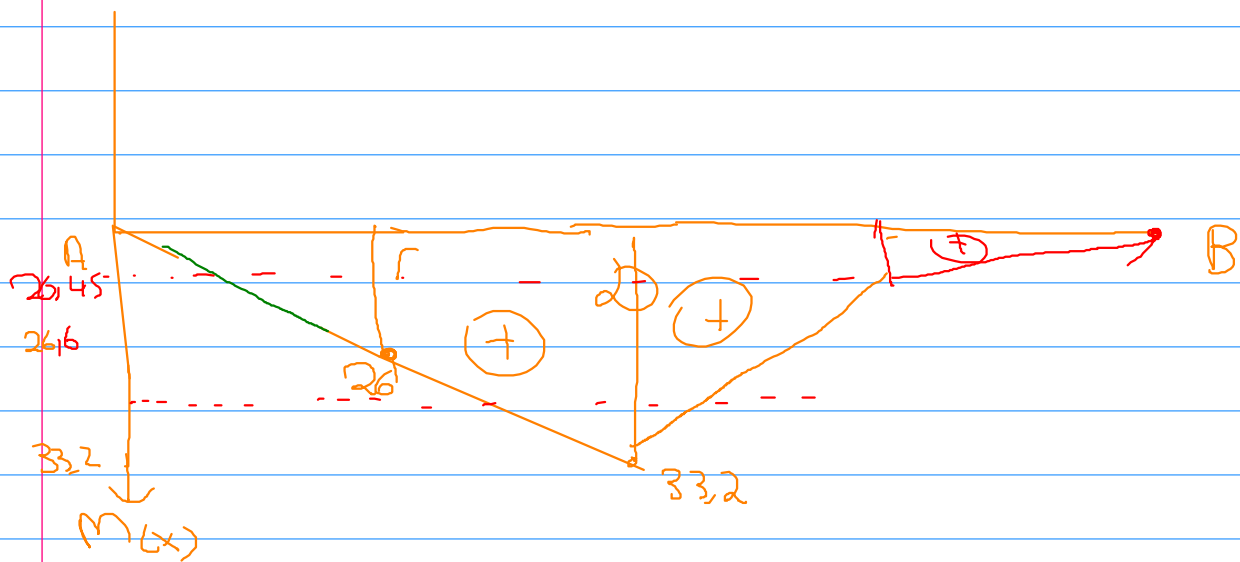
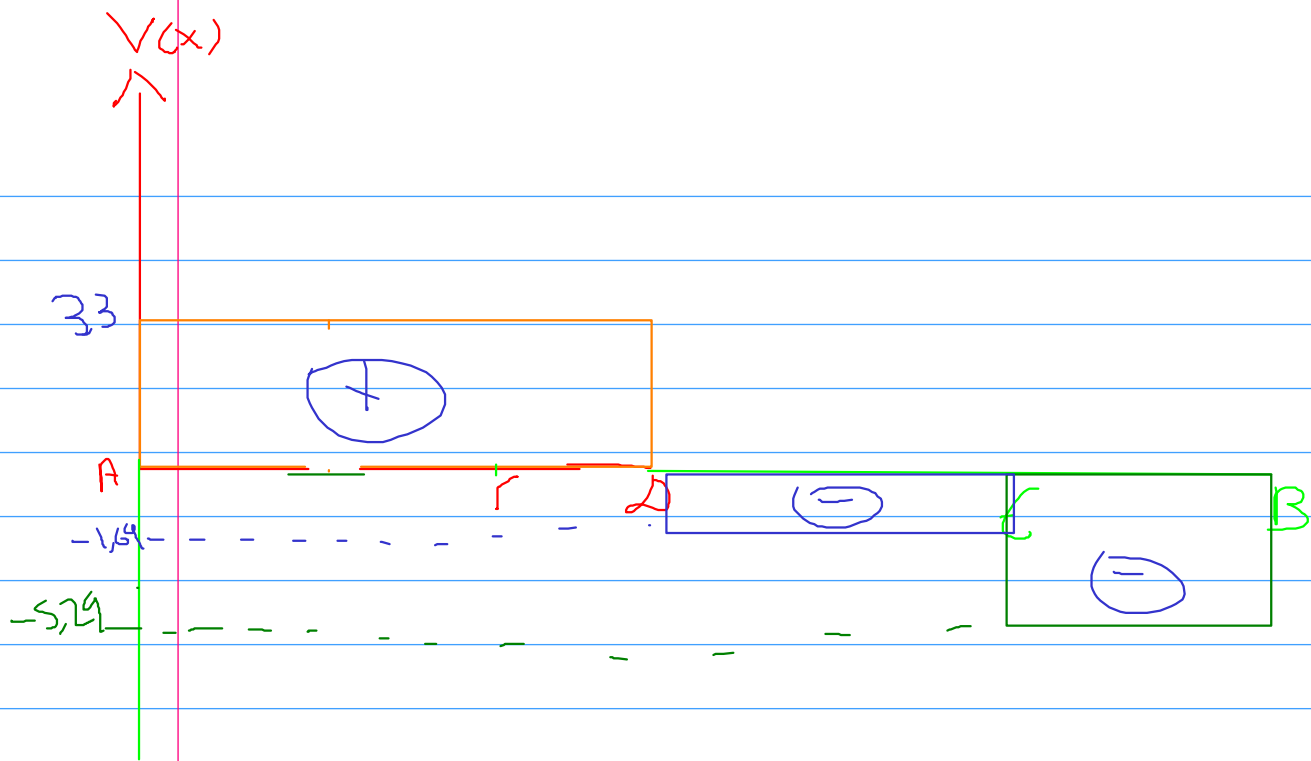
$$\begin{aligned} (+\uparrow) \sum F_y &= 0 \\ V(x) - 3,6 + 5,29 &= 0 \\ V(x) &= 1,69 \text{ kN} \end{aligned}$$

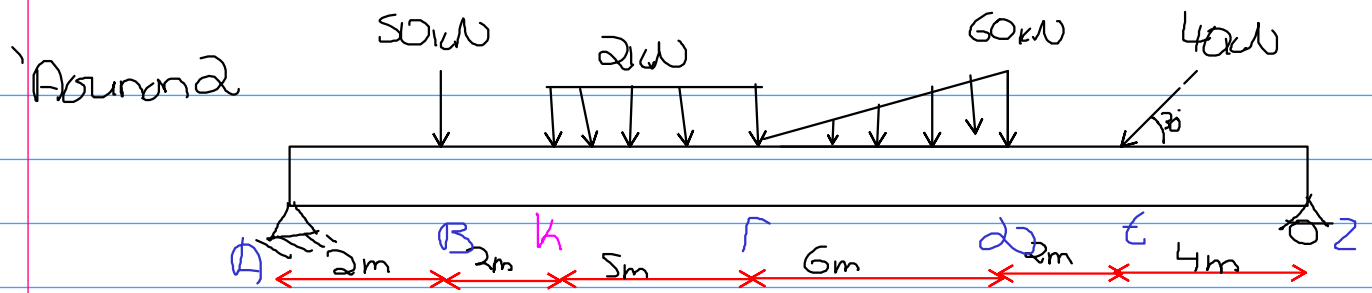
$$\begin{aligned} (\curvearrowright) \sum M_x &= 0 \\ -m(x) - 3,6x + 5,29(5+x) &= 0 \end{aligned}$$

$$\begin{aligned} \text{Eo } x=0 &\Rightarrow M = 26,45 \text{ kNm} \\ \text{B: } x=4 &\Rightarrow M = 33,21 \text{ kNm} \\ \text{Eo } x=5 &= 26,45 \text{ kNm} \end{aligned}$$

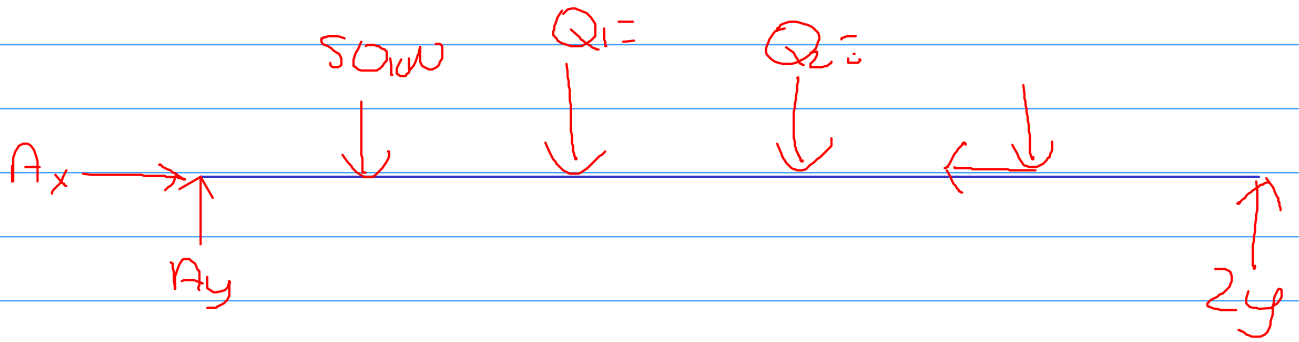
$N(x)$







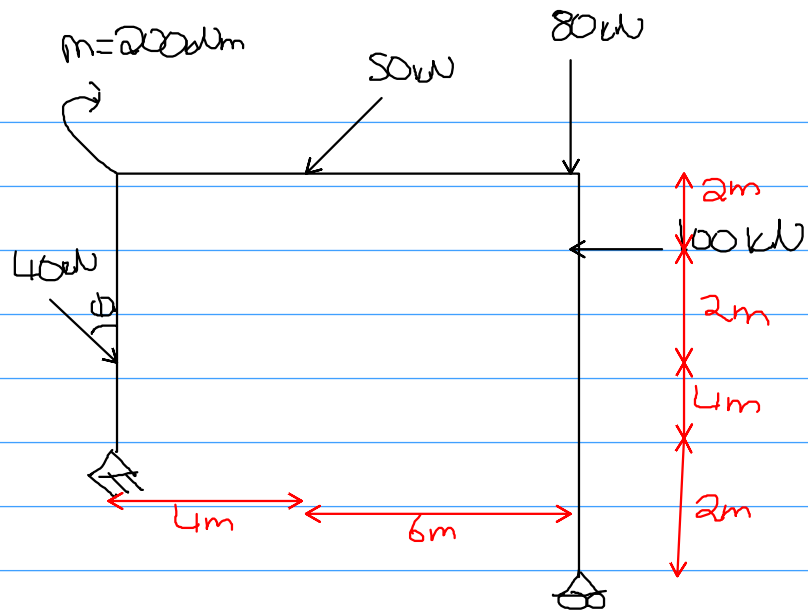
Βήμα 1^ο Φτιάχνω το QES και υπολογίζω τις
 μετ. στρώσεων



Τίτλος

3ⁿ Aroun

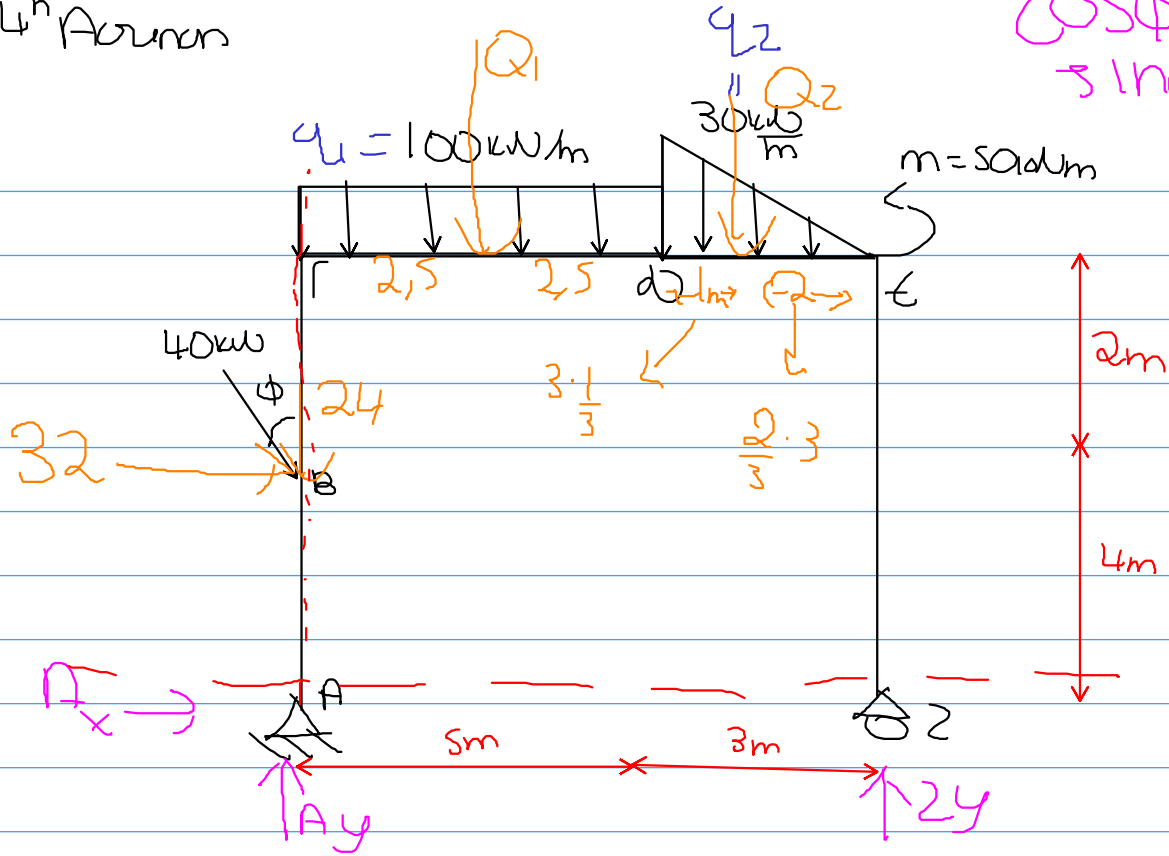
$$\cos\phi = 0,8$$
$$\sin\phi = 0,6$$



4th Aachen

$$\cos \phi = 0,8$$

$$\sin \phi = 0,6$$



$$Q_1 = q_1 \cdot 5 = 100 \cdot 5 = 500 \text{ kN}$$

$$Q_2 = \frac{30 \cdot 3}{2} = 45 \text{ kN}$$

$$F_x = 40 \cdot \cos \phi = 40 \cdot 0,8 = 32 \text{ kN}$$

$$F_y = 40 \cdot \sin \phi = 40 \cdot 0,6 = 24 \text{ kN}$$

$$\sum F_x = 0$$

$$A_x + 32 = 0$$

$$A_x = -32 \text{ kN}$$

$$\sum F_y = 0$$

$$A_y - 24 - Q_1 - Q_2 + 2y = 0$$

$$A_y + 2y = 569$$

$$A_y + 200 = 569$$

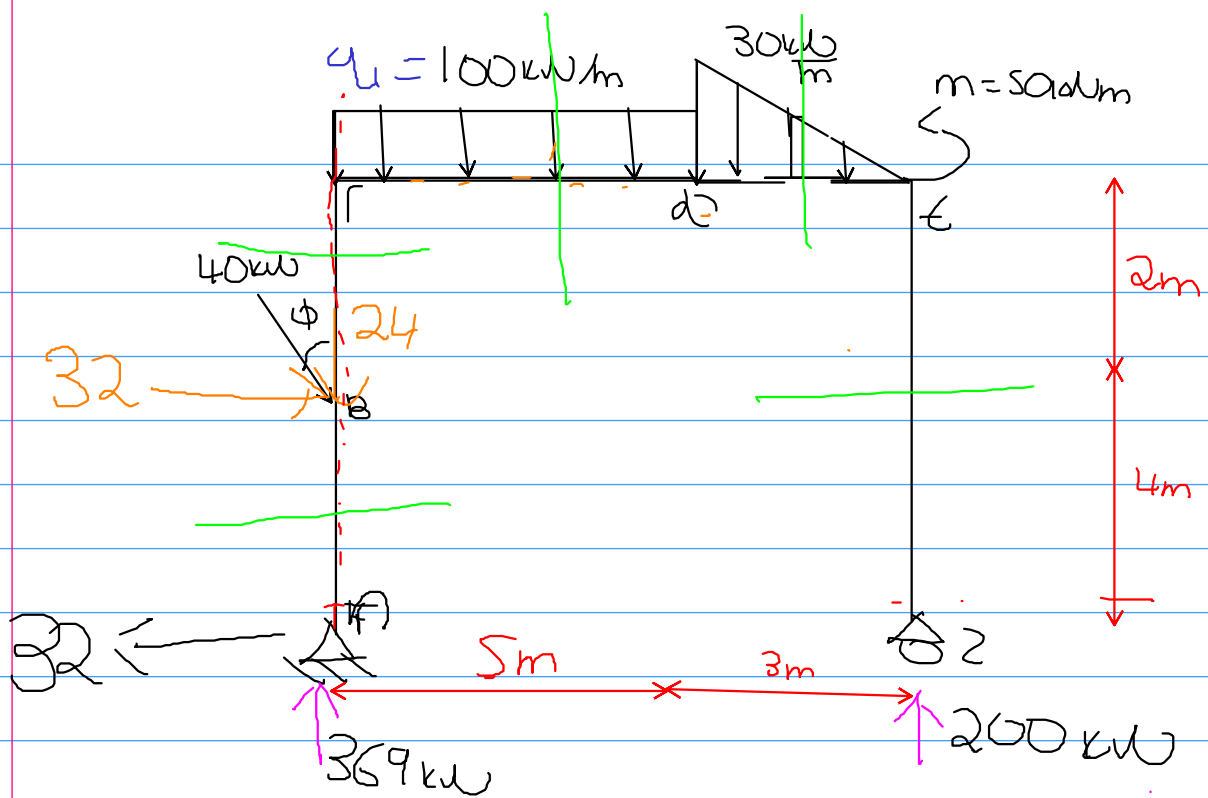
$$A_y = 369 \text{ kN}$$

$$\sum M_A = 0$$

$$-F_x \cdot 4 = Q_1 \cdot 2,5 - Q_2 \cdot 6 + 2y \cdot 8 + m = 0$$

$$-32 \cdot 4 = 500 \cdot 2,5 - 45 \cdot 6 + 2y \cdot 8 + 50 = 0$$

$$\Rightarrow 2y = 200 \text{ kN}$$



Top of AB $0.5 \times 5.4 \text{ (m)}$

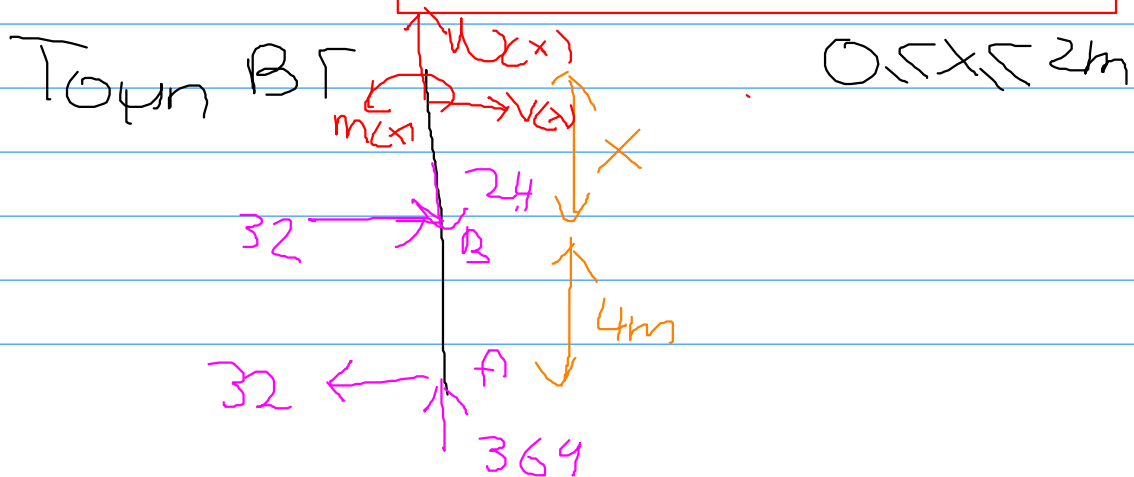
Free body diagram of the top half of the column (AB):

$\uparrow W(x)$
 $\rightarrow V(x)$
 $\curvearrowright M(x)$
 $32 \leftarrow$
 369

$(+) \sum F_x = 0 \quad (+) \sum F_y = 0$
 $V(x) - 32 = 0 \quad W(x) - 369 = 0$
 $V(x) = 32 \text{ kN} \quad W(x) = 369 \text{ kN}$

$(+) \sum M_x = 0$
 $M(x) - 32x = 0$
 $M(x) = 32x$

$\Gamma_{A \text{ @ } x=0} \Rightarrow M = 0 \text{ kNm}$
 $B \text{ @ } x=4 \Rightarrow M = 128 \text{ kNm}$



$$(\rightarrow) \sum f_x = 0$$

$$32 - 32 + V(x) = 0$$

$$V(x) = 0 \text{ kN}$$

$$\sum f_y = 0$$

$$W(x) + 369 - 240 = 0$$

$$W(x) = -345 \text{ kN}$$

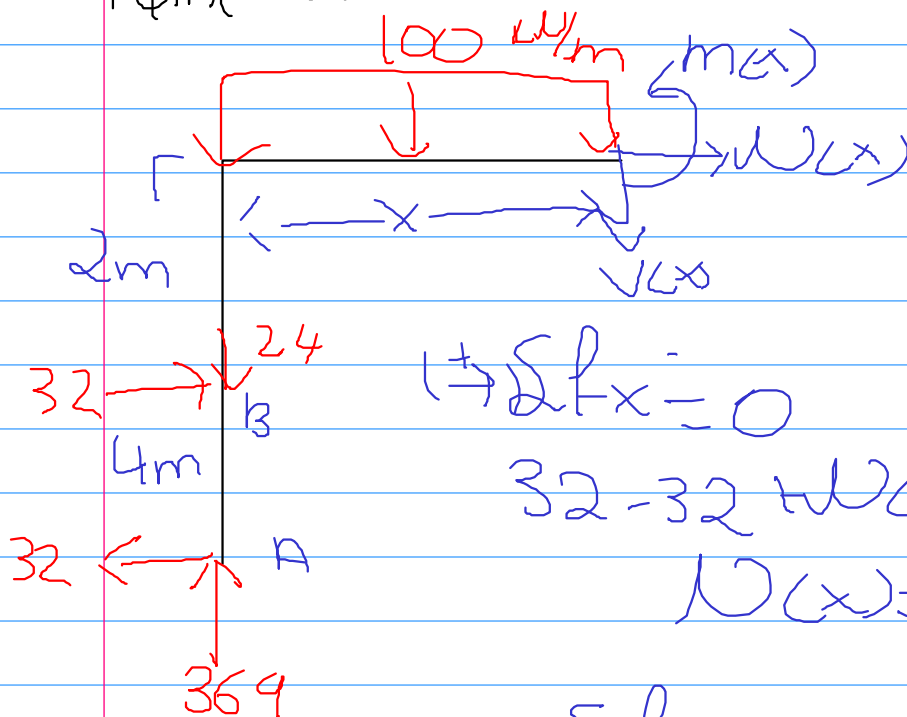
$$(\curvearrowright) \sum m_x = 0$$

$$m(x) + 32(x) - 32(4+x) = 0$$

$$\text{For } B_0^0 x = 0 \Rightarrow m(0) = 128 \text{ kNm}$$

$$\text{For } x = 2 \Rightarrow m(2) = 128 \text{ kNm}$$

Turn moment $\Gamma(x)$ $0 \leq x \leq 5$



$$Q' = 100x$$

$$(\rightarrow) \sum f_x = 0$$

$$32 - 32 + W(x) = 0$$

$$W(x) = 0$$

$$\sum f_y = 0$$

$$369 - V(x) - 24 - 100x = 0$$

$$V(x) = 345 - 100x$$

$$\text{For } x = 0 \Rightarrow V(0) = 345 \text{ kN}$$

$$\text{For } x = 5 \Rightarrow V(5) = -155 \text{ kN}$$

$$5125m_x = 0$$

$$m(x) = 100x \cdot \frac{x}{2} + 24x + 32 \cdot 2 - 32 \cdot 6 - 369 \cdot x = 0$$

$$m(x) = 50x^2 - 24x + 128 + 369x$$

$$\Gamma_0 x=0 \Rightarrow 128 \text{ kNm}$$

$$\Delta_0 x=5 \Rightarrow +3103 \text{ kNm}$$

$$\frac{dm(x)}{dx} = 100x - 24 + 369 \Rightarrow x = +3,45 \quad m(+3,45) =$$

$$\frac{dm(x)}{dx^2} = 100 > 0 \quad \text{στο έλεγχος της κοίτης}$$

