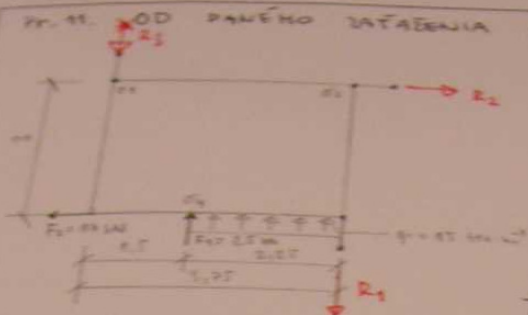


Pr. 11. OD PANEHO ZATAENIA URČITE REAKIE NA TUHEJ POSKE.



$$\sum \ominus M_{O_1} = 0$$

$$F_1 \cdot 1.5 - F_2 \cdot 3 + q \cdot 2.25 \cdot 2.625 - R_1 \cdot 3.75 = 0$$

$$25 \cdot 1.5 - 17.3 - 45 \cdot 2.25 \cdot 2.625 - R_1 \cdot 3.75 = 0$$

$$37.5 - 51 + 88.59375 - R_1 \cdot 3.75 = 0$$

$$R_1 \cdot 3.75 = 75.09375$$

$$\underline{R_1 = 20.025 \text{ kN}}$$

$$\rightarrow \ominus \sum H = 0$$

$$-F_2 + R_2 = 0$$

$$-17 + R_2 = 0$$

$$\underline{R_2 = 17 \text{ kN}}$$

$$\sum \ominus M_{O_3} = 0$$

$$\sum M_{O_3} = 0$$

$$-F_1 \cdot 2.25 - F_2 \cdot 3 - q \cdot 2.25 \cdot 1.125 - R_3 \cdot 3.75 = 0$$

$$-25 \cdot 2.25 - 17 \cdot 3 - 15 \cdot 2.25 \cdot 1.125 - R_3 \cdot 3.75 = 0$$

$$-56.25 - 51 - 37.96875 - R_3 \cdot 3.75 = 0$$

$$R_3 \cdot 3.75 = -145.21875$$

$$R_3 = -38.725$$

$$\underline{R_3 = 38.725}$$

KONTROLA

$\uparrow \ominus$

$$\sum V = 0$$

$$F_1 + q \cdot 2.25 - R_1 - R_3 = 0$$

$$25 + 37.75 - 20.025 - 38.725 = 0$$

$0 = 0$

$\curvearrowright \oplus$

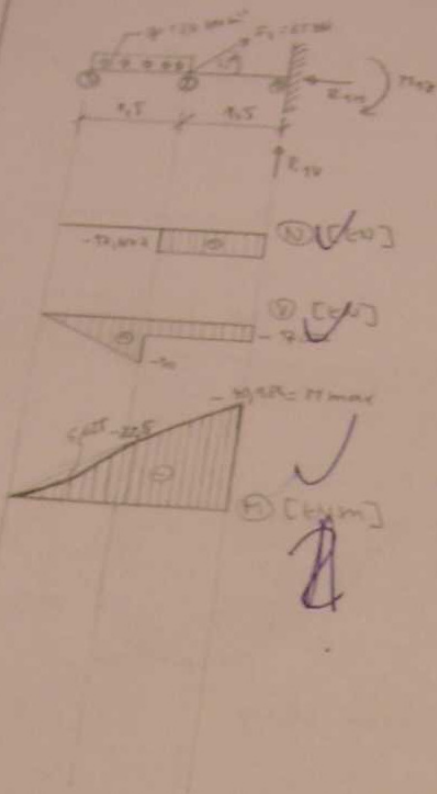
$$\sum M_{O_1} = 0$$

$$q \cdot 2.25 \cdot 1.125 - R_1 \cdot 2.25 - R_2 \cdot 3 + R_3 \cdot 1.5 = 0$$

$$37.96875 - 55.05625 - 51 + 58.0875 = 0$$

$0 = 0$

Pr. 12. OD DANÉHO USTÁIENIA URČITE REAKCIE NA KONZOLE.



$$\begin{aligned} \rightarrow \oplus \\ \sum H = 0 \quad -R_{1H} + F_1 \cdot \cos \alpha = 0 \\ -R_{1H} + 25 \cdot \cos 45^\circ = 0 \end{aligned}$$

$$\underline{R_{1H} = 17,677 \text{ kN}}$$

$$\begin{aligned} \uparrow \oplus \\ \sum V = 0 \quad R_{1V} + F_1 \cdot \sin \alpha - q \cdot 1,5 = 0 \\ R_{1V} + 25 \cdot \sin 45^\circ - 20 \cdot 1,5 = 0 \end{aligned}$$

$$\underline{R_{1V} = 12,322 \text{ kN}}$$

$$\begin{aligned} \curvearrowright \oplus \\ \sum M_1 = 0 \quad -M_{12} - F_1 \cdot \sin \alpha \cdot 1,5 + q \cdot 1,5 \cdot 2,25 = 0 \\ -M_{12} - 25 \cdot \sin 45^\circ \cdot 1,5 + 20 \cdot 1,5 \cdot 2,25 = 0 \end{aligned}$$

$$\underline{M_{12} = 40,983 \text{ kN}\cdot\text{m}}$$

KONTROLA

$$\curvearrowright \oplus \quad \sum M_2 = 0$$

$$R_{1V} \cdot 1,5 - M_{12} + q \cdot 1,5 \cdot 0,75 = 0$$

$$12,322 \cdot 1,5 - 40,983 + 20 \cdot 1,5 \cdot 0,75 = 0$$

$$18,483 - 40,983 + 22,5 = 0$$

$$0 = 0$$

$$N_{12} = 0 \text{ kN} = N_{23}$$

$$N_{21} = -F_{1H} = -17,677 \text{ kN}$$

$$N_{12}^P = -R_{1H} = -17,677 \text{ kN}$$

$$V_{22} = 0 \text{ kN}$$

$$V_{23} = -q \cdot 1,5 = -20 \cdot 1,5 = -30 \text{ kN}$$

$$V_{21} = -q \cdot 1,5 + F_{1V} = -30 + 17,677 = -12,323 \text{ kN} = V_{12}$$

$$V_{12}^P = -R_{1V} = -12,322 \text{ kN}$$

$$M_{13} = 0 \text{ kN}\cdot\text{m}$$

$$M_{12} = -q \cdot 1,5 \cdot 0,75 = -20 \cdot 1,5 \cdot 0,75 = -22,5 \text{ kN}\cdot\text{m}$$

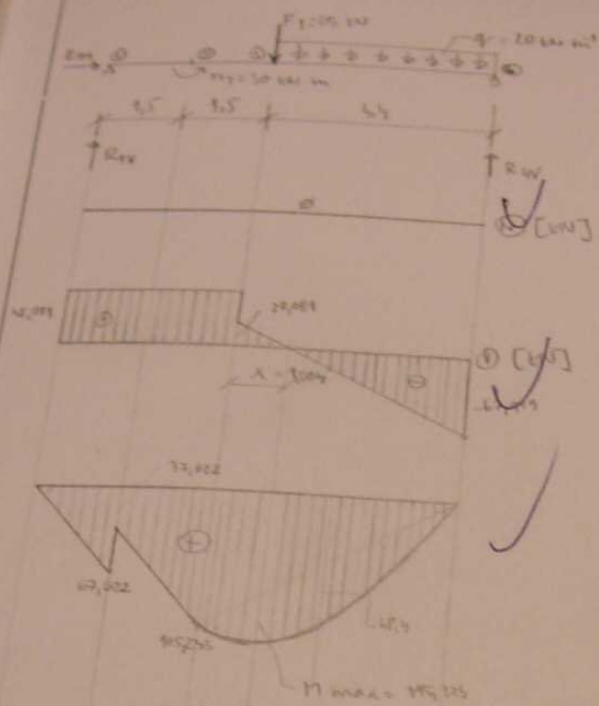
$$\begin{aligned} M_{12} &= -q \cdot 1,5 \cdot 2,25 + F_{1V} \cdot 1,5 = -20 \cdot 1,5 \cdot 2,25 + 17,677 \cdot 1,5 = \\ &= -40,983 \text{ kN}\cdot\text{m} \end{aligned}$$

$$M_{12}^P = -M_{12} = -40,983 \text{ kN}\cdot\text{m}$$

$$M_0 = \frac{1}{8} q \cdot l^2 = \frac{1}{8} 20 \cdot 1,5^2 = 5,625 \text{ kN}\cdot\text{m}$$

$$M_{\max} = -40,983 \text{ kN}\cdot\text{m}$$

Pr. 15. OD DANÉHO ZATAŽENIA UŽÍTE REAKCIE NA NOSNIKU.



$$\sum H = 0 \quad E_H = 0$$

$$\sum M_0 = 0$$

$$-R_{1v} \cdot 7,5 + M_1 + F_1 \cdot 4,5 + q \cdot 4,5 \cdot 2,25 = 0$$

$$-R_{1v} \cdot 7,5 + 30 + 25 \cdot 4,5 + 20 \cdot 4,5 \cdot 2,25 = 0$$

$$-R_{1v} \cdot 7,5 + 30 + 110 + 195,6 = 0$$

$$R_{1v} = 45,081 \text{ kN}$$

$$\sum M_1 = 0$$

$$M_1 - F_1 \cdot 3 - q \cdot 4,5 \cdot 5,25 + R_{1v} \cdot 7,5 = 0$$

$$30 - 25 \cdot 3 - 20 \cdot 4,5 \cdot 5,25 + R_{1v} \cdot 7,5 = 0$$

$$30 - 75 - 457,6 + R_{1v} \cdot 7,5 = 0$$

$$R_{1v} = 67,918 \text{ kN}$$

KONTROLA

$$\sum V = 0$$

$$R_{1v} - F_1 - q \cdot 4,5 + R_{1v} = 0$$

$$45,081 - 25 - 20 \cdot 4,5 + 67,918 = 0$$

$$9,001 = 0$$

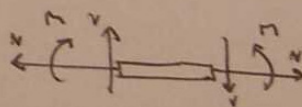
$$\sum M_2 = 0$$

$$-R_{1v} \cdot 1,5 + M_2 - F_1 \cdot 1,5 - q \cdot 4,5 \cdot 3,75 + R_{1v} \cdot 5,9 = 0$$

$$-45,081 \cdot 1,5 + 30 - 25 \cdot 1,5 - 20 \cdot 4,5 \cdot 3,75 + 67,918 \cdot 5,9 = 0$$

$$-67,6215 + 30 - 37,5 - 325,6 + 400,7162 = 0$$

$$-0,0053 = 0$$



$$V_{12} = R_{1v} = 45,081 \text{ kN} = V_2 = V_{32}$$

$$V_{35} = R_{1v} - F_1 = 45,081 - 25 = 20,081 \text{ kN}$$

$$V_{45} = R_{1v} - F_1 - q \cdot 4,5 = 45,081 - 25 - 20 \cdot 4,5 = -67,918 \text{ kN}$$

$$V_{45}^P = -R_{1v} = -67,918 \text{ kN}$$

$$M_1 = 0 \text{ kN} \cdot \text{m}$$

$$M_{21} = R_{1v} \cdot 1,5 = 45,081 \cdot 1,5 = 67,622 \text{ kN} \cdot \text{m}$$

$$M_{22} = R_{1v} \cdot 1,5 - M_1 = 45,081 \cdot 1,5 - 30 = 37,622 \text{ kN} \cdot \text{m}$$

$$M_3 = R_{1v} \cdot 3 - M_1 = 45,081 \cdot 3 - 30 = 105,243 \text{ kN} \cdot \text{m}$$

$$M_4 = R_{1v} \cdot 7,5 - M_1 - F_1 \cdot 4,5 - q \cdot 4,5 \cdot 2,25 =$$

$$= 45,081 \cdot 7,5 - 30 - 25 \cdot 4,5 - 20 \cdot 4,5 \cdot 2,25 =$$

$$= 333,5995 - 30 - 110 - 195,6 = 0 \text{ kN} \cdot \text{m}$$

$$M_0 = \frac{1}{8} q \cdot l^2 = \frac{1}{8} 20 \cdot 4,5^2 = 58,5 \text{ kN} \cdot \text{m}$$

$$V(x) = 0$$

$$R_{1v} - F_1 - q \cdot x = 0$$

$$45,081 - 25 - 20 \cdot x = 0$$

$$x = 1,005 \text{ m}$$

$$x = l_{\text{max}} = R_{1v} \cdot (3 + x) - M_1 - F_1 \cdot x - q \cdot x \cdot \frac{x}{2} = 45,081 \cdot 4,005 - 30 - 25 \cdot 1,005 - 20 \cdot 1,005 \cdot \frac{1,005}{2} =$$

$$= 115,325 \text{ kN} \cdot \text{m}$$