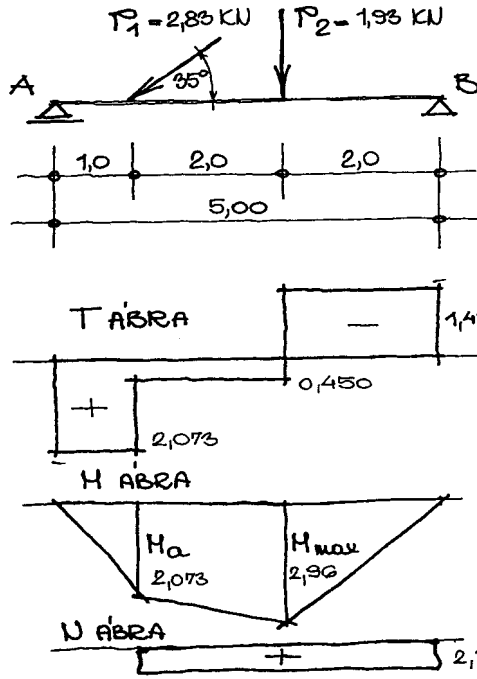


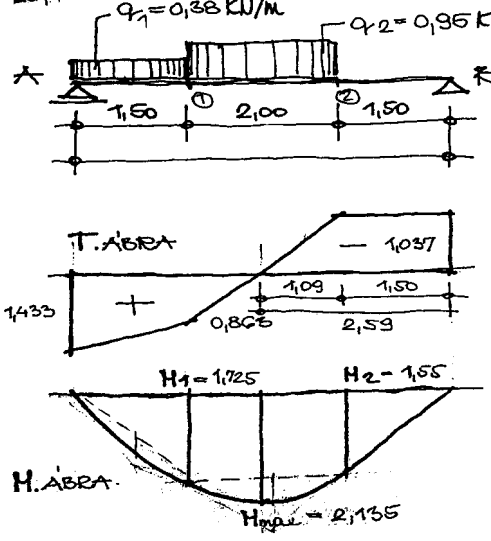
IV/2. BELSŐERŐ ÁBRÁK

1. PÉLDA MEGOLDÁS.



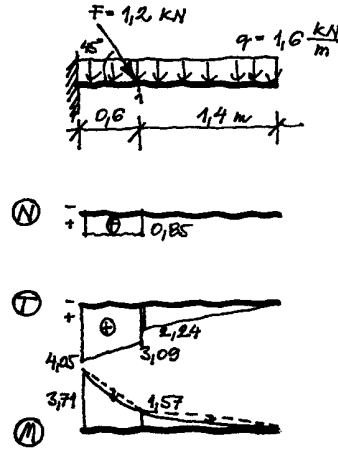
$\cos 35^\circ = 0,81915$
 $\sin 35^\circ = 0,57358$
 $P_{1x} = 2,83 \cdot 0,81915 = 2,318$
 $P_{1y} = 2,83 \cdot 0,57358 = 1,623$
 $B_y = \frac{1,0 \cdot 1,623 + 3,0 \cdot 1,93}{5,0} = 1,48 \uparrow$
 $A_y = \frac{2,0 \cdot 1,93 + 4,0 \cdot 1,623}{5,0} = 2,073 \uparrow$
 $A_x = 2,073 \uparrow$
 $B_x = 2,318 \rightarrow$
 $H_{max} = 1,48 \times 2,0 = 2,96$
 $H_a = 2,073 \times 1,0 = 2,073$

2. példa. megoldása.



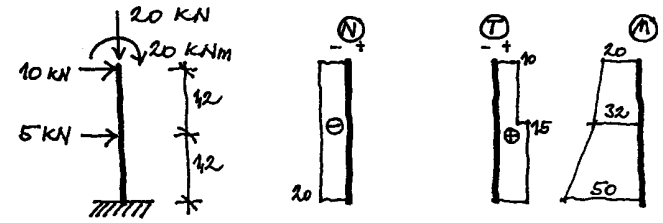
$A_x = B_x = 0$
 $B = \frac{0,427 + 4,75^2}{5,0} = 1,037$
 $A_y = \frac{(2,0 \times 2,5 \times 0,95) + (4,25 \times 1,5 \times 0,38)}{5,0} = 1,433$
 $A_y = \frac{4,75 + 2,422}{5,0} = 1,433$
 $H_1 = (1,5 \cdot 1,433) - (0,75 \cdot 0,57)$
 $H_1 = 1,725 \text{ kN/m}$
 $H_2 = 1,5 \cdot 1,037 = 1,55 \text{ kN/m}$
 $x_0 = \frac{1,037}{0,95} = 1,090$
 $H_{max} = \frac{(2,19 \cdot 1,037)}{8} + 1,09 \cdot 0,95$
 $H_{max} = 2,170 - 0,545 + 1,035 = 2,660 \text{ kN/m}$
 Parabola lefogása:
 $\frac{a \cdot x^2}{8} = \frac{0,95 \cdot x^2}{8} = 0,475 \text{ kN/m}$
 $\frac{0,38 \cdot 2,25}{8} = 0,108 \text{ kN/m}$

IV/3. BELSŐERŐ - ÁBRÁK



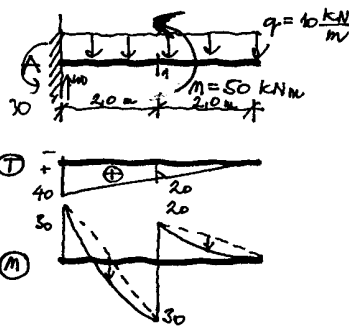
$F_x = 0,85 \text{ kN}$; $F_y = 0,85 \text{ kN}$
 $A_x = 0,85 \text{ kN} (\leftarrow)$
 $A_y = 1,6 \cdot 2 + 0,85 = 4,05 \text{ kN} (\uparrow)$
 $M_A = 0,85 \cdot 0,6 - 1,6 \cdot 2 \cdot 1 = -3,71 \text{ kNm} \curvearrowright$
 $M_1 = -(1,6 \cdot 1,4 \cdot 0,7) = -1,57 \text{ kNm}$

IV/4.



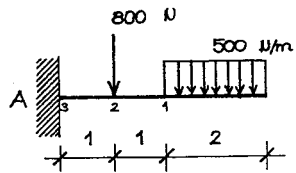
$A_x = 15 \text{ kN} (\leftarrow)$; $M_A = 20 + 10 \cdot 2,4 + 5 \cdot 4,2 = 50 \text{ kNm} \curvearrowright$
 $A_y = 20 \text{ kN} (\uparrow)$

IV/5.



$A = 40 \text{ kN} \uparrow$
 $M_A = 30 \text{ kNm} \curvearrowright$
 $M_{1a} = -(10 \cdot 2 \cdot 1) = -20 \text{ kNm}$
 $M_{1b} = -(10 \cdot 2 \cdot 1 - 30) = +30 \text{ kNm}$

IV./6. BELSŐERŐ - ÁBRÁK



Szerkesszük meg a tartó belsőerő ábráit!

$$\sum P_y = 0 \quad A = 500 \cdot 2,0 + 800 = 1800 \text{ N}$$

$$M_A = 500 \cdot 2,0 \cdot 1,0 + 800 \cdot 1,0 = 3800 \text{ N}\cdot\text{m}$$

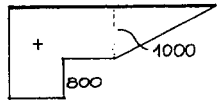
$$M_1 = 500 \cdot 2,0 \cdot 1,0 = 1000 \text{ N}\cdot\text{m}$$

$$M_2 = 500 \cdot 2,0 \cdot 2,0 = 2000 \text{ N}\cdot\text{m}$$

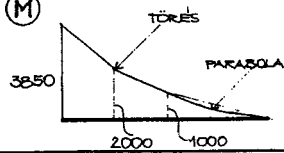
$$M_3 = 500 \cdot 2,0 \cdot 3,0 + 800 \cdot 1,0 = 3800 \text{ N}\cdot\text{m}$$

$$\frac{q l^2}{8} = \frac{500 \cdot 4}{8} = 250 \text{ N}\cdot\text{m}$$

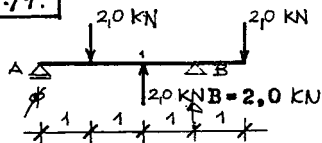
(T)



(M)



IV./7.



Szerkesszük meg a tartó belsőerő ábráit!

$$\sum M_A = 0$$

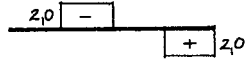
$$2,0 \cdot 1,0 - 2,0 \cdot 2,0 + 2,0 \cdot 4,0 = B \cdot 3,0 = 0$$

$$B = 2,0 \text{ kN} \uparrow \quad A = 0$$

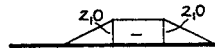
$$M_B = 2,0 \cdot 1,0 = 2,0 \text{ kN}\cdot\text{m}$$

$$M_1 = 2,0 \cdot 1,0 = 2,0 \text{ kN}\cdot\text{m}$$

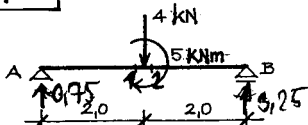
(T)



(M)



IV./8.



Szerkesszük meg a tartó belsőerő ábráit!

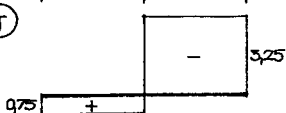
$$A = 2,0 - \frac{5,0}{4,0} = 2,0 - 1,25 = 0,75 \text{ kN} \uparrow$$

$$B = 2,0 + 1,25 = 3,25 \text{ kN} \uparrow$$

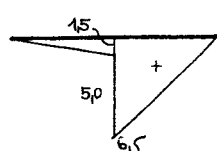
$$M_1 = 0,75 \cdot 2,0 = 1,5 \text{ kN}\cdot\text{m}$$

$$M_2 = M_1 + M = 1,5 + 5 = 6,5 \text{ kN}\cdot\text{m}$$

(T)

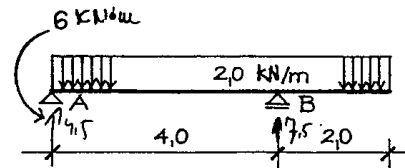


(M)



IV./9.

BELSŐERŐ - ÁBRÁK



Szerkesszük meg a tartó belsőerő ábráit!

$$\sum M_A = 0$$

$$-6,0 + 2,0 \cdot 6,0 \cdot 3,0 - B \cdot 4,0 = 0$$

$$B = 7,5 \text{ kN} \uparrow$$

$$A = 4,5 \text{ kN} \uparrow$$

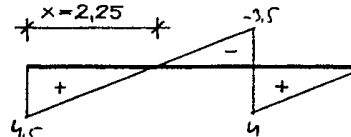
$$A - qx = 0 \quad x = \frac{4,5}{2} = 2,25 \text{ m}$$

$$M = -6,0 + 4,5 \cdot 2,25 - 2 \cdot \frac{2,25^2}{2} =$$

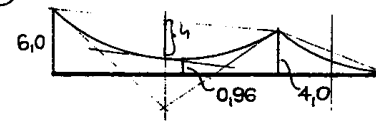
$$= -0,96 \text{ kN}\cdot\text{m}$$

$$\frac{q l^2}{8} = \frac{2,0 \cdot 16}{8} = 4,0 \text{ kN}\cdot\text{m}$$

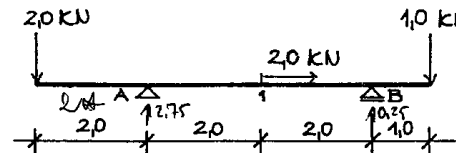
(T)



(M)



IV./10.



Szerkesszük meg a tartó belsőerő ábráit!

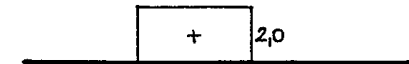
$$\sum M_A = 0$$

$$-2,0 \cdot 2,0 - B \cdot 4,0 + 1,0 \cdot 5,0 = 0$$

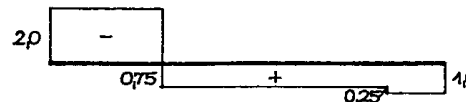
$$B = 0,25 \text{ kN} \uparrow$$

$$A = 2,75 \text{ kN} \uparrow$$

(N)



(T)



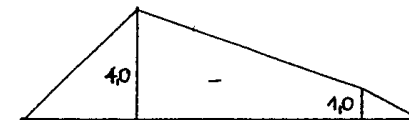
$$M_A = -2,0 \cdot 2,0 = 4,0 \text{ kN}\cdot\text{m}$$

$$M_1 = -2,0 \cdot 4,0 + 2,75 \cdot 2,0 =$$

$$= -3,0 \text{ kN}\cdot\text{m}$$

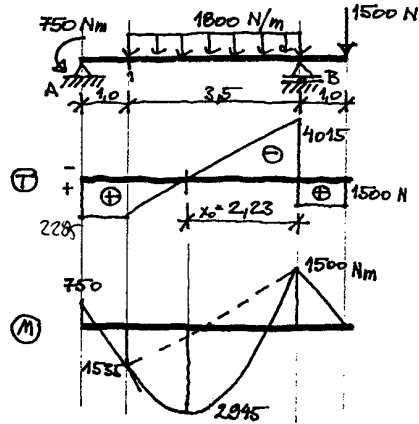
$$M_2 = 1,0 \cdot 1,0 = 1,0 \text{ kN}\cdot\text{m}$$

(M)



IV./M.

BELSFERD - ABRAK



$$A = \frac{750 + 1800 \cdot 3,5 - 1500}{4,5} = 2285 \text{ (}\uparrow\text{)}$$

$$B = 5515 \text{ N (}\uparrow\text{)}$$

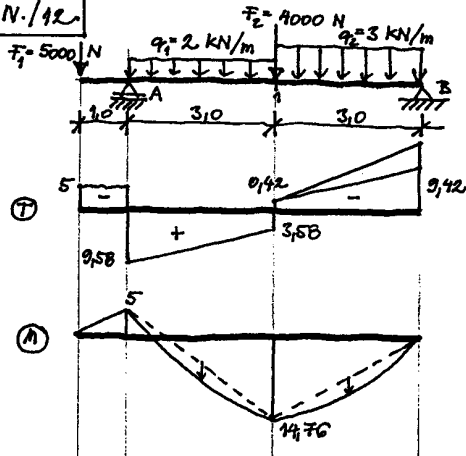
$$M_B = -(1500 \cdot 1) = -1500 \text{ Nm}$$

$$M_A = -750 + 2285 \cdot 1 = +1535 \text{ Nm}$$

$$x_0 = \frac{4015}{1800} = 2,23 \text{ m}$$

$$M_{\max} = -(1500 \cdot 3,23 - 5515 \cdot 2,23 + 1800 \cdot \frac{2,23^2}{2}) = 2945 \text{ Nm}$$

N./12.



$$0 = \Sigma M_B = -7,5 + 6 \cdot A - 4,5 \cdot 6 - 3 \cdot 4 - 1,5 \cdot 9$$

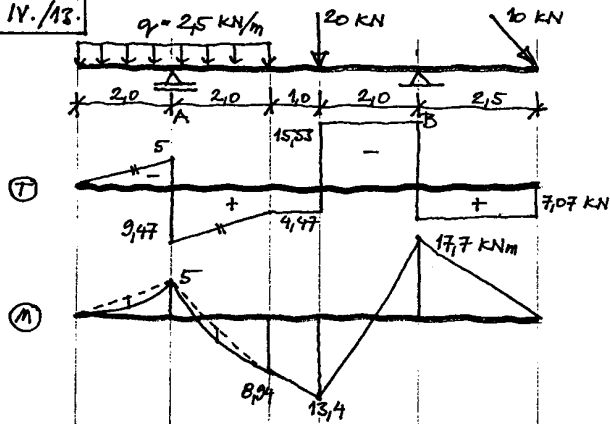
$$A = 14,58 \text{ kN (}\uparrow\text{)}$$

$$B = 9,42 \text{ kN (}\uparrow\text{)}$$

$$M_A = -5 \text{ kNm}$$

$$M_{\max} = -(-9,42 \cdot 3 + 3 \cdot 3 \cdot 1,5) = 14,76 \text{ kNm}$$

IV./13.

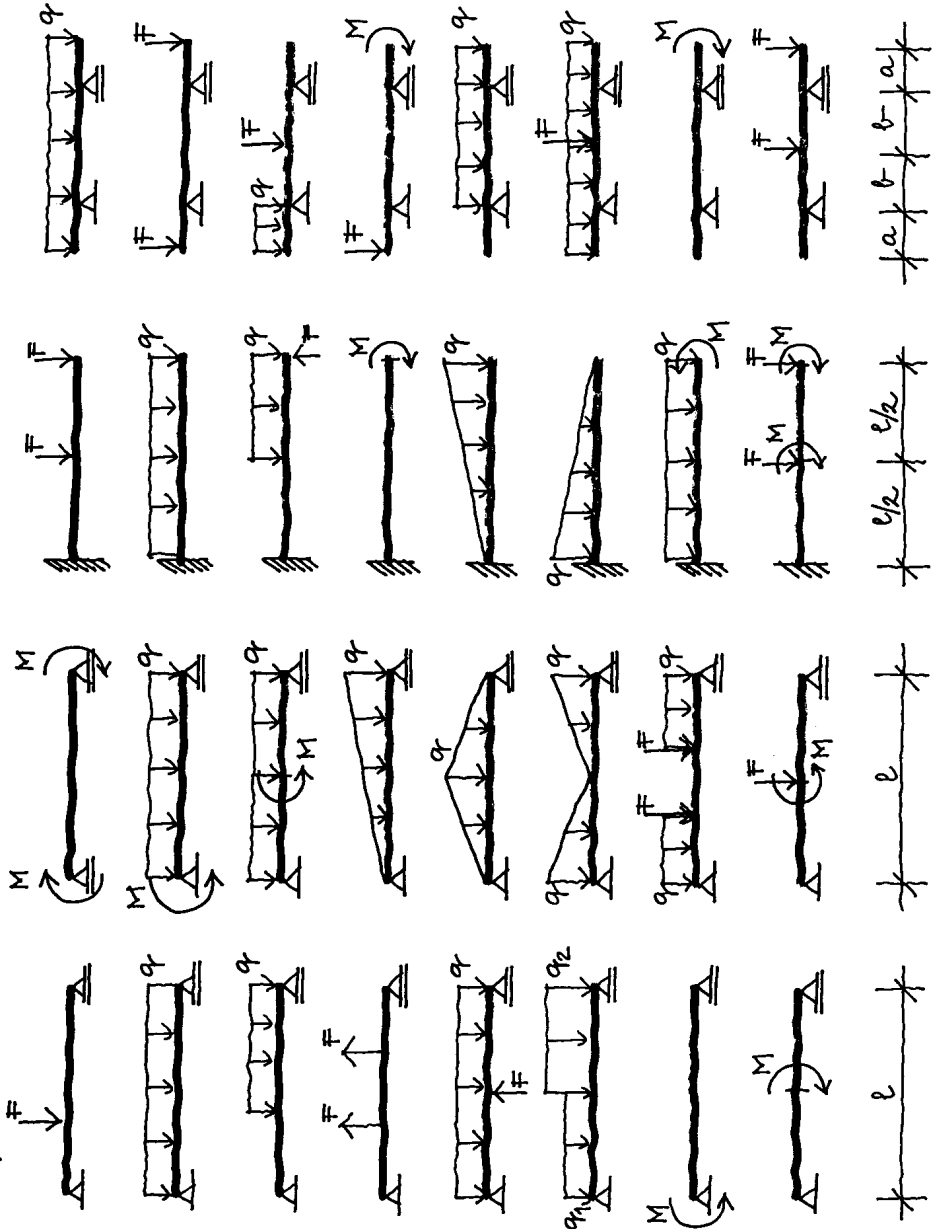


$$B_y = 22,6 \text{ kN (}\uparrow\text{)}$$

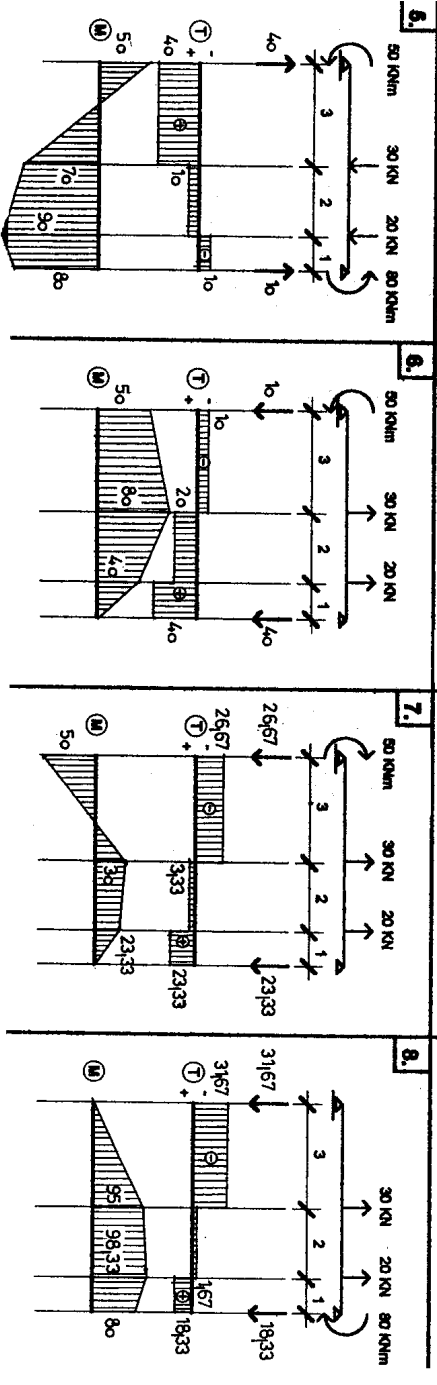
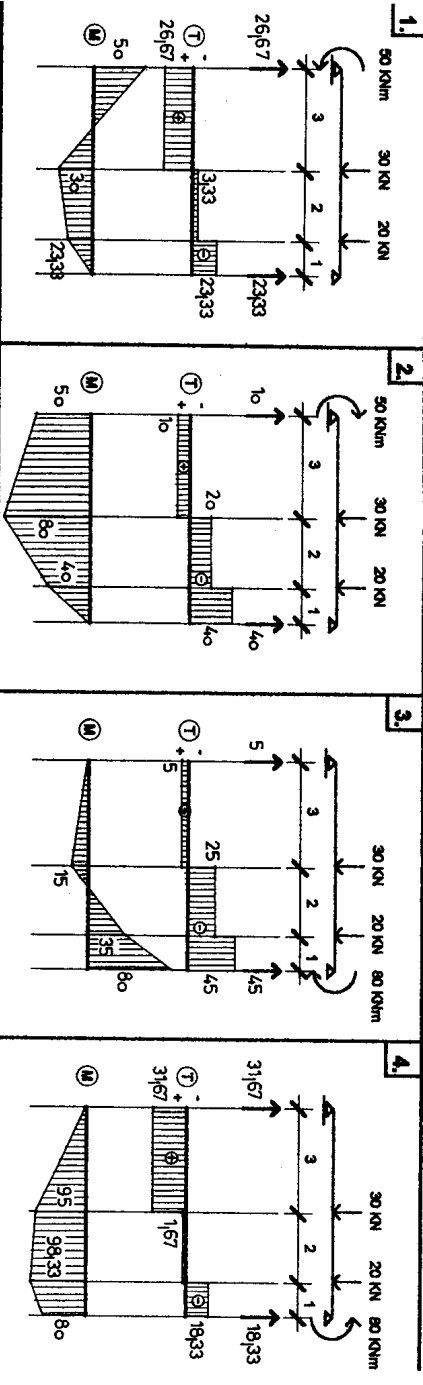
$$A = 14,47 \text{ kN (}\uparrow\text{)}$$

$$B_x = 7,07 \text{ kN (}\leftarrow\text{)}$$

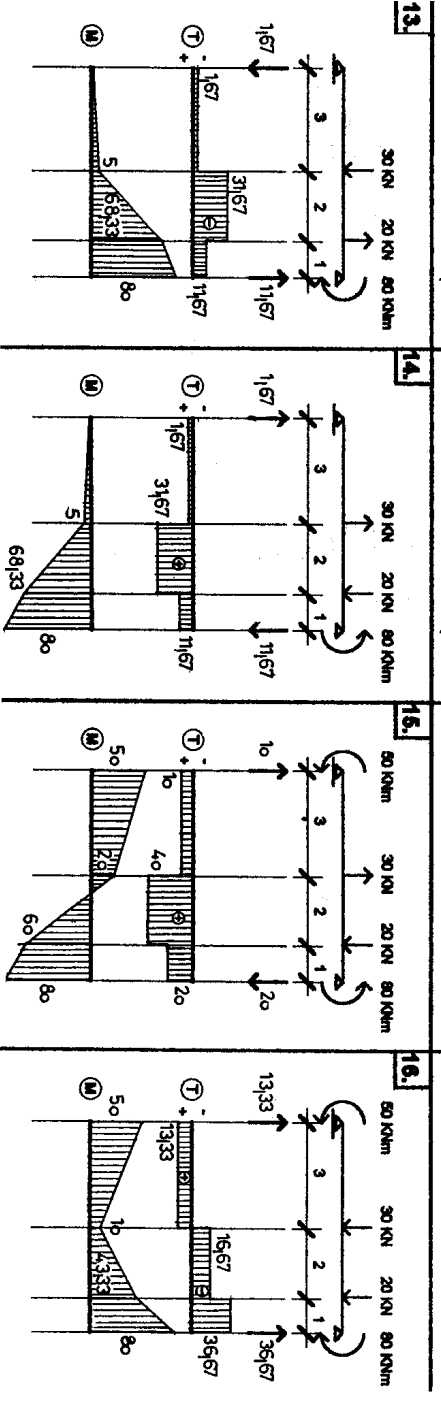
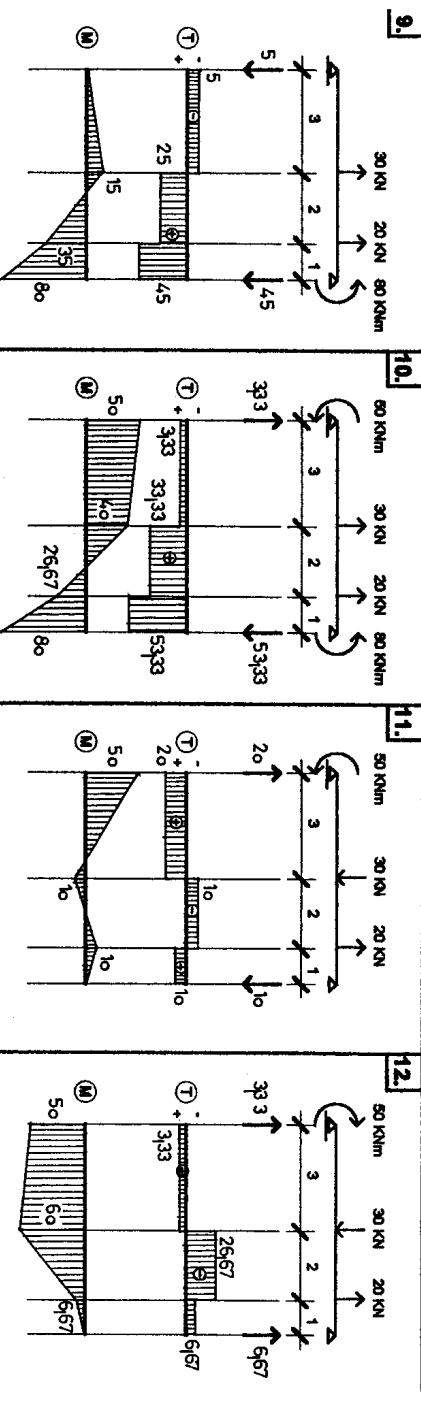
ALAPESZETEK



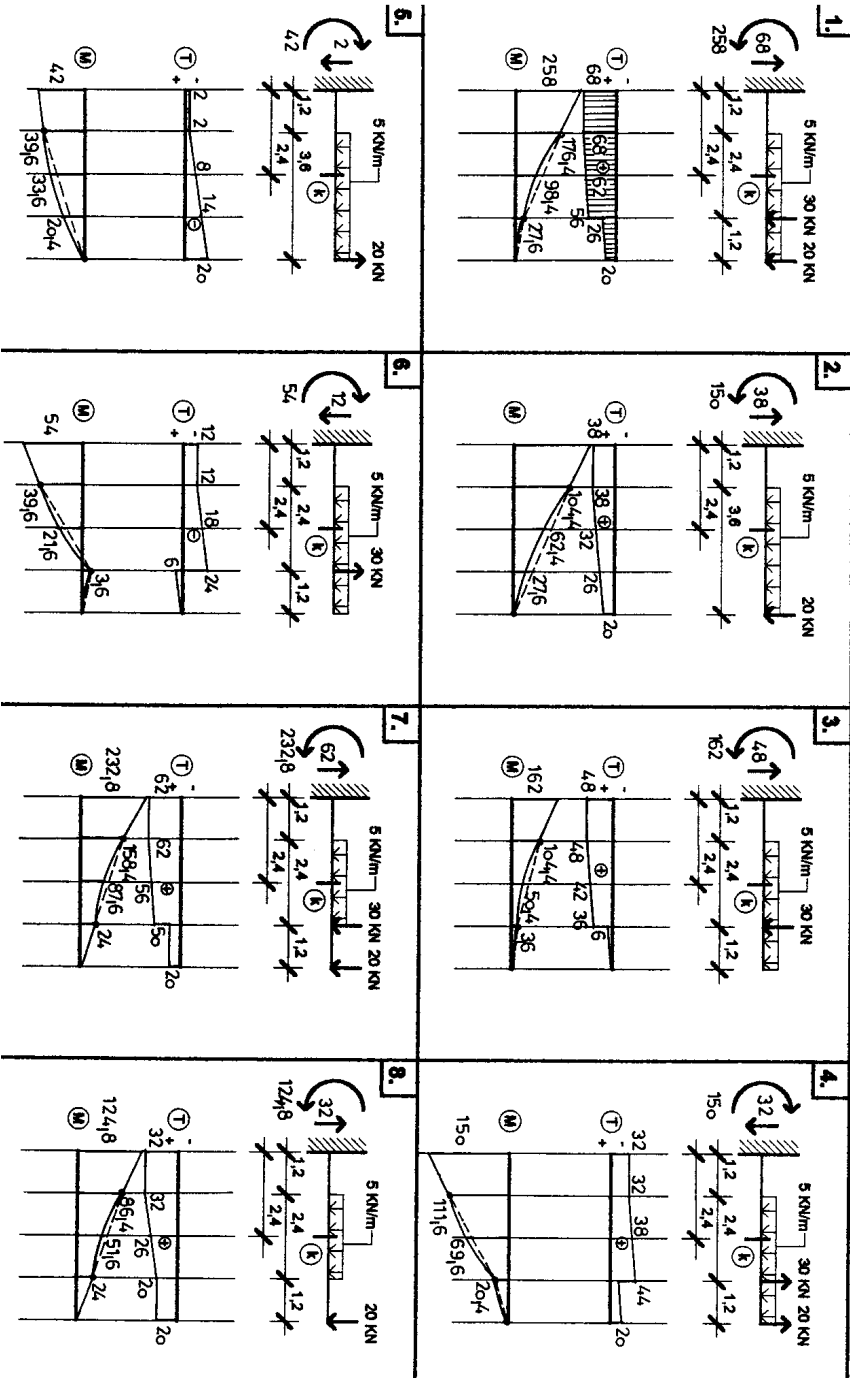
1. peltida



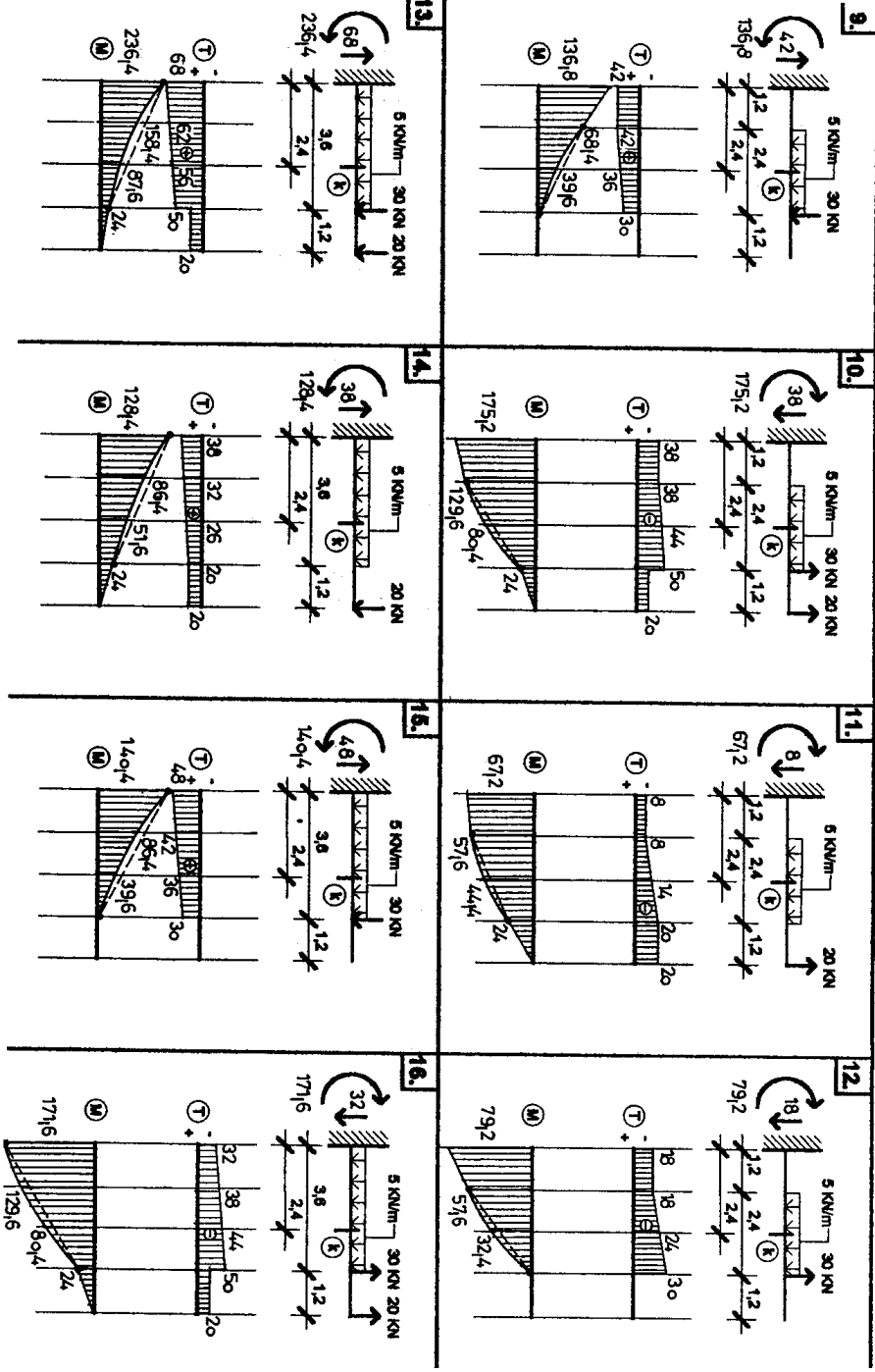
1. peltida



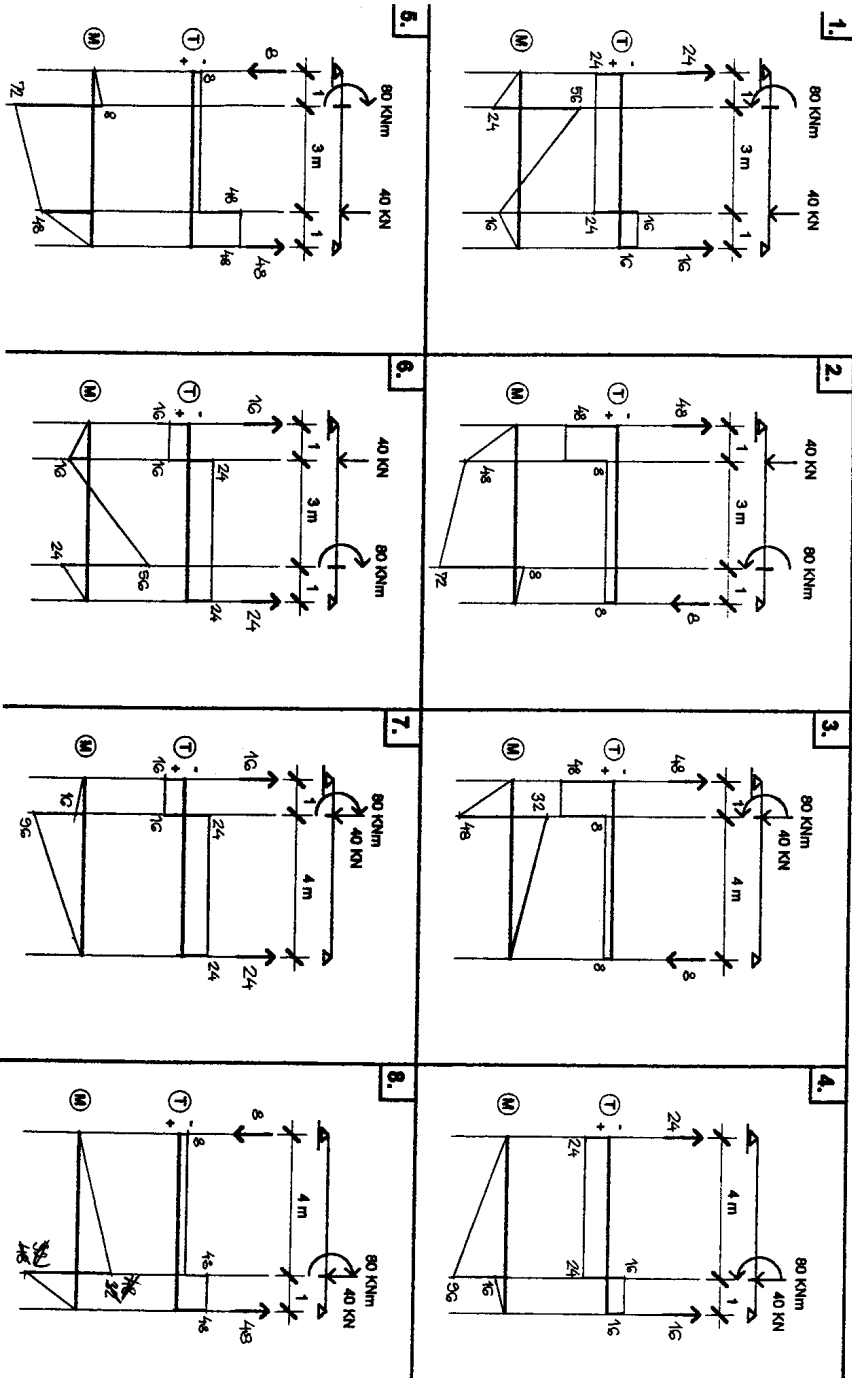
2. peldā



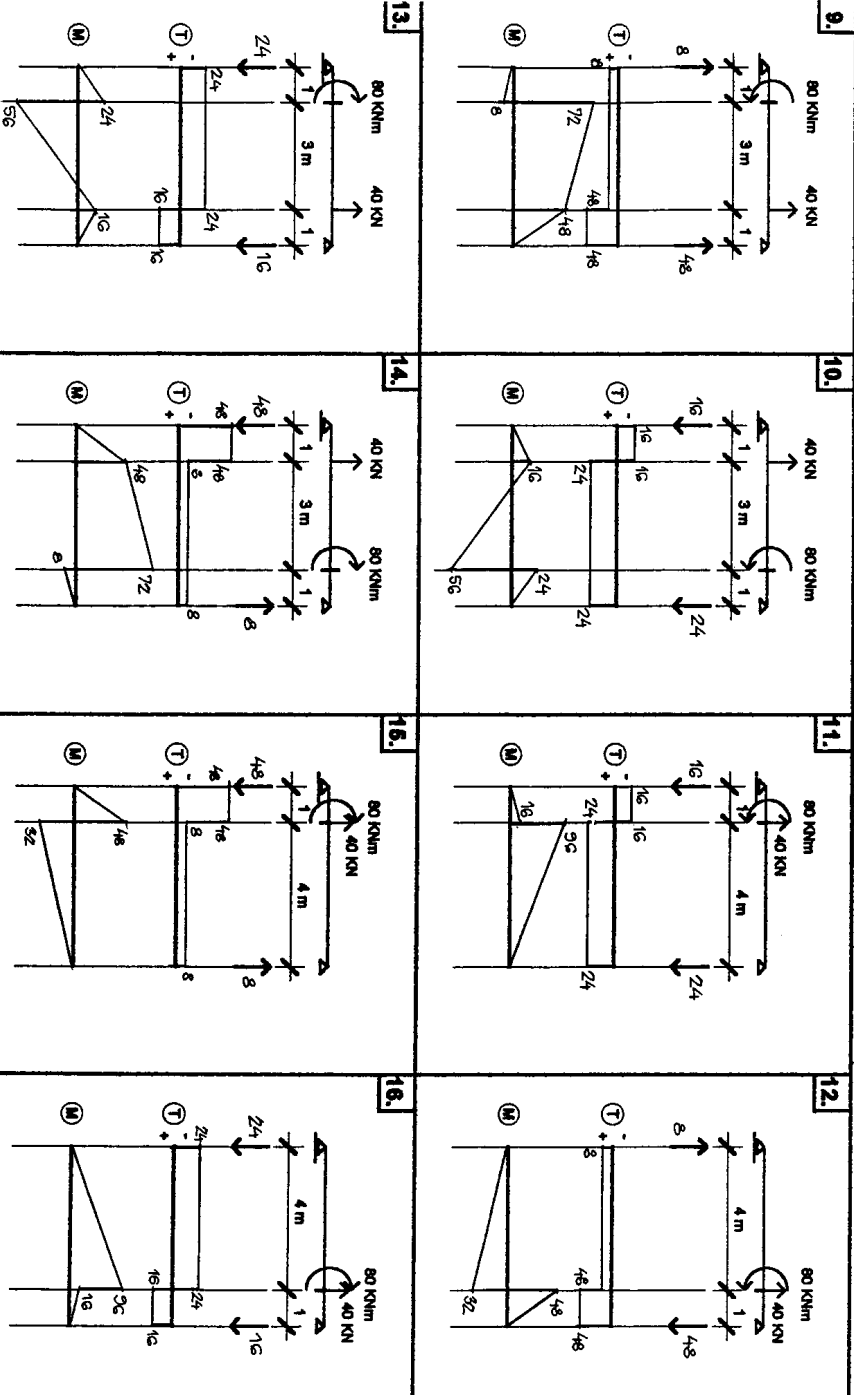
2. peldā



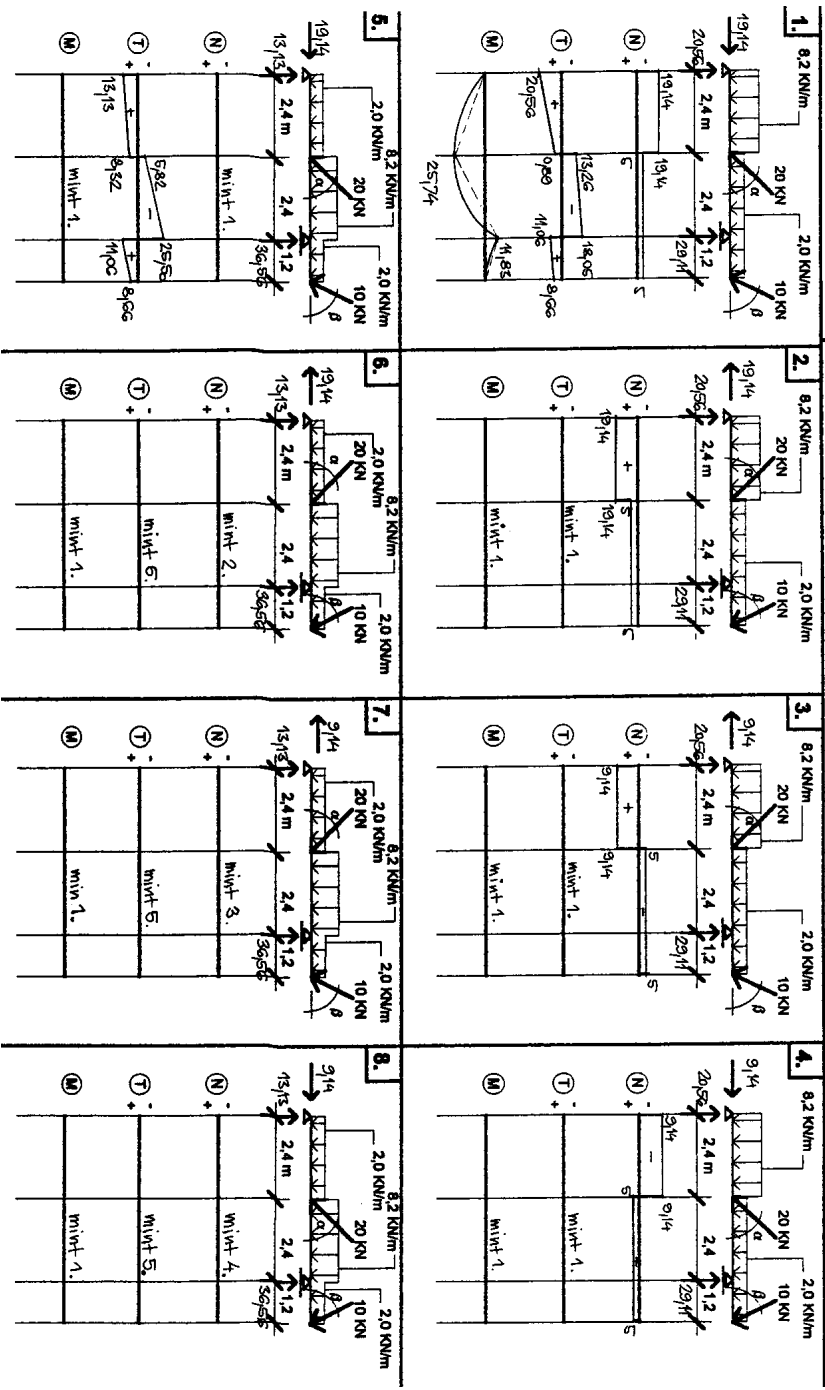
3. peida



3. peida



4. peldā



4. peldā

