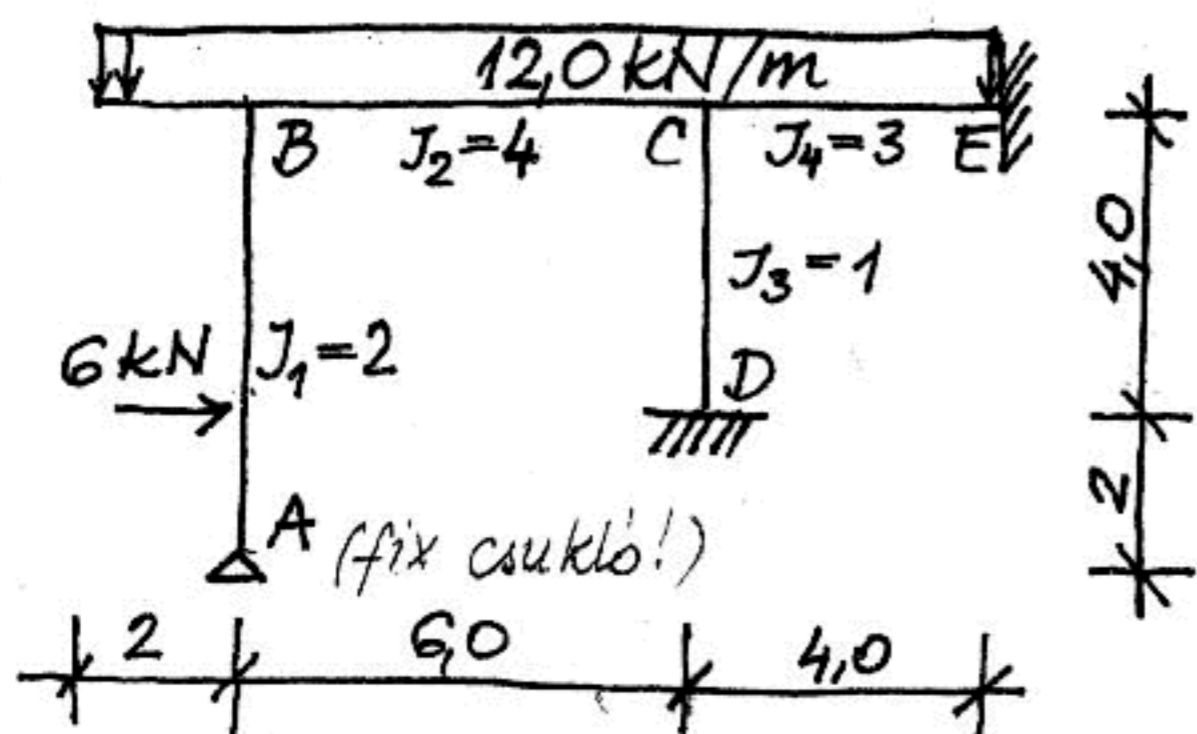


N. 11. évf. T. 8. gyak.:

1. pl: Oldjuk meg a feladatot, ha az „A” támasz fix csukló!

feladatot, ha az „A”



- merevségek:

$$k_1 = \frac{3 \cdot 2}{6} = 1,0$$

$$k_2 = \frac{4 \cdot 4}{6} = 2,66$$

$$k_3 = \frac{4 \cdot 1}{4} = 1,0$$

$$k_4 = \frac{4 \cdot 3}{4} = 3,0$$

$$\left. \begin{matrix} k_1 \\ k_2 \end{matrix} \right\} \Sigma k_B = 3,66$$

$$\left. \begin{matrix} k_3 \\ k_4 \end{matrix} \right\} \Sigma k_C = 6,66$$

- nyomatékosztók:

$$\alpha_{1B} = \frac{1,0}{3,66} = 0,27; \alpha_{2B} = 0,73$$

$$\alpha_{2C} = \frac{2,66}{6,66} = 0,4; \alpha_{3C} = \frac{1,0}{6,66} = 0,15$$

$$\alpha_{4C} = \frac{3,0}{6,66} = 0,45$$

- nyomatékosztás:

	0,73	0,4	0,45	
24	0,27	+36,0	-36,0	0,15
①	-5,33	-1,8	-4,87	-2,43
			②	+2,97
③	-1,21	+4,49	-3,28	-1,64
			④	+0,66
⑤	-0,09	+0,33	-0,24	~0
-24,0				-30,44
-8,43				+3,61
				+26,84
				-10,58
				+1,68
				+0,12
				+1,80

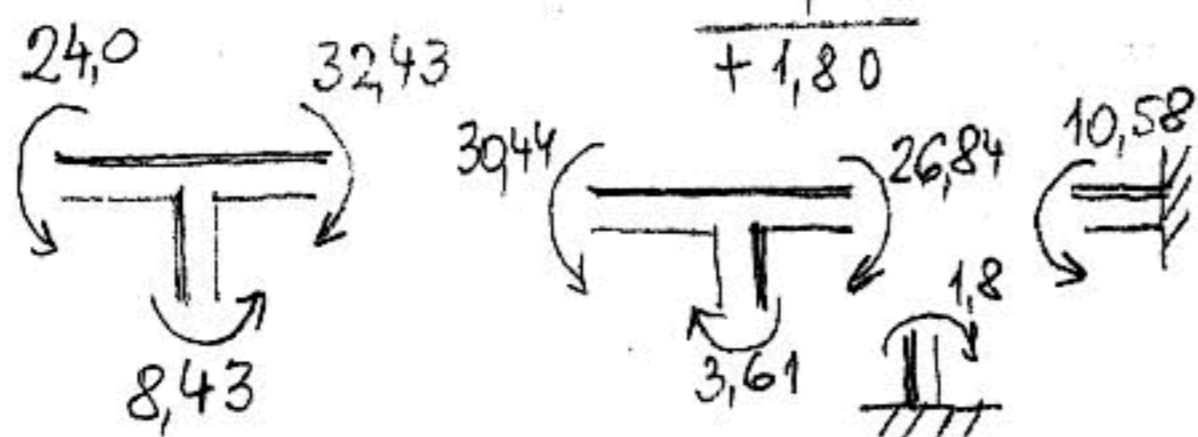
kezdeti bef. nyomatékok:

$$M_{BK}^0 = -\frac{1}{2} \cdot 12 \cdot 2^2 = -24,0 \text{ kNm}$$

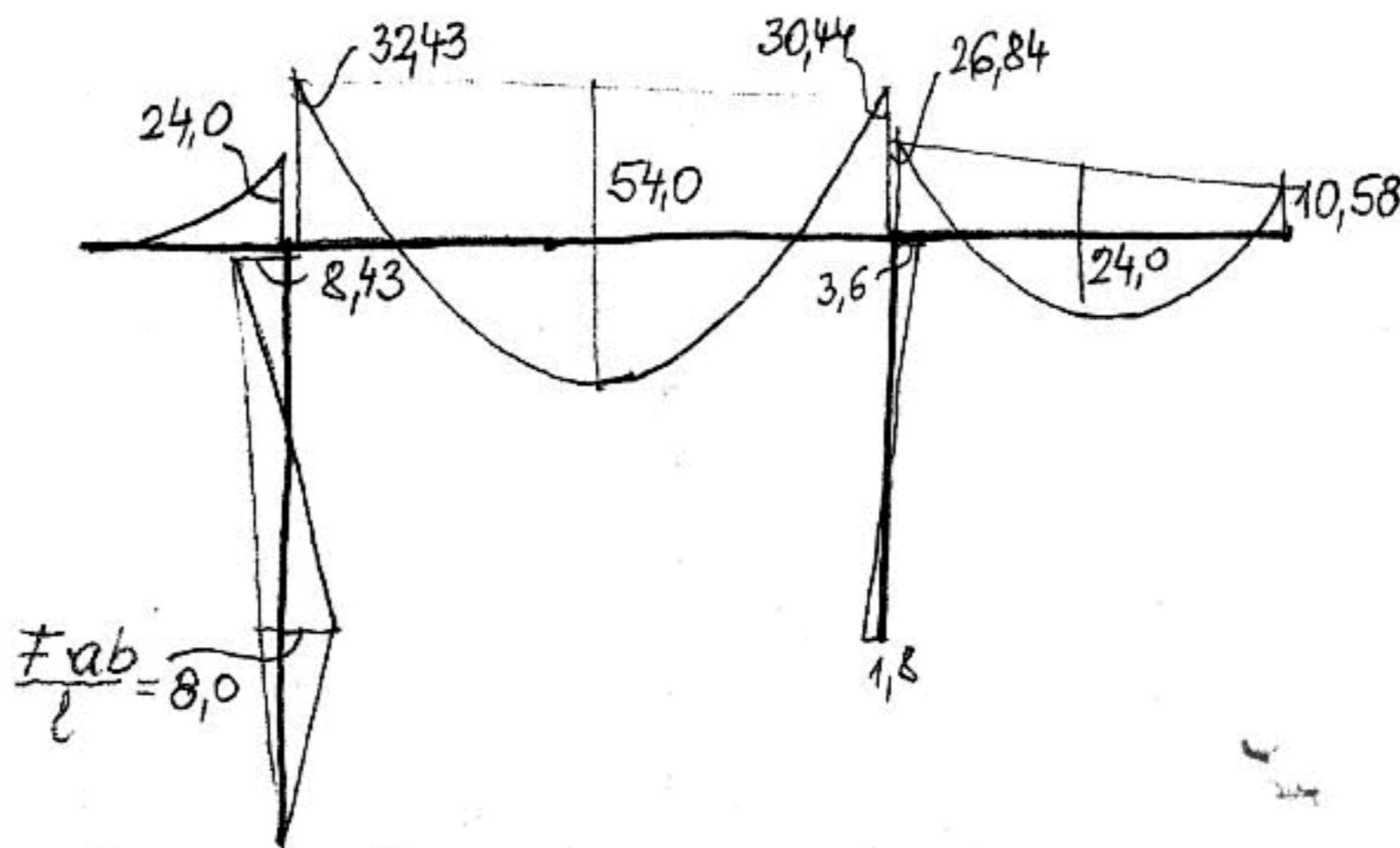
$$M_{B1}^0 = -\frac{F \cdot a \cdot b}{2 \cdot l^2} \cdot (l+a) = -\frac{6 \cdot 2 \cdot 4}{2 \cdot 6^2} \cdot 8 = -5,33 \text{ kNm}$$

$$M_{B2}^0 = -M_{C2}^0 = \frac{1}{12} \cdot 12 \cdot 6^2 = +36,0 \text{ kNm}$$

$$M_{C3}^0 = -M_E^0 = \frac{1}{12} \cdot 12 \cdot 4^2 = +16,0 \text{ kNm}$$



M ábra:



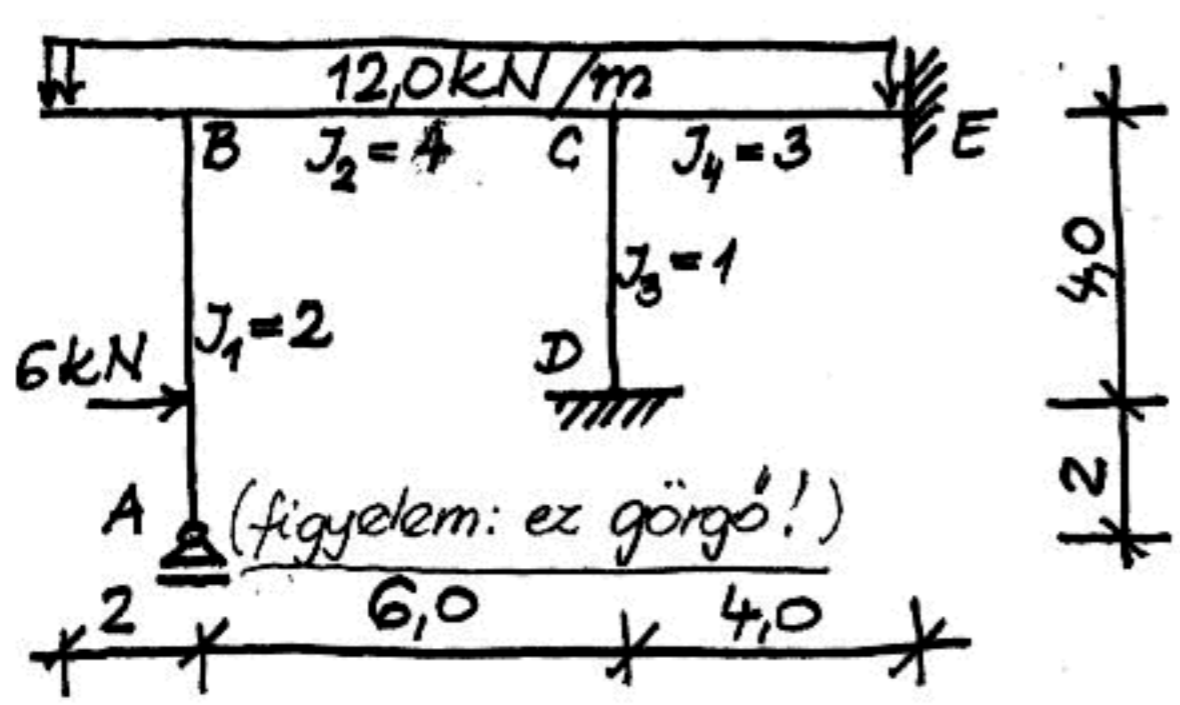
Mekkora v_B , ha $I_3 = 60.000 \text{ cm}^4$ és $E = 1000 \text{ kN/cm}^2$?

$$\Delta M_B = + 11,49 \cdot 10^2 \text{ kNcm}$$

$$\Sigma k_B = \frac{3,66 \cdot 6 \cdot 10^7}{100 (!)} = 2,2 \cdot 10^6$$

$$v_B = \frac{+ 11,49 \cdot 10^2}{2,2 \cdot 10^6} = + 5,2 \cdot 10^{-4} \text{ m}$$

N. II. évfolyam T.8. gyakorlat Példák
 (ez csak gyakorlás!)
 1. pl: Határozza meg a keret belsőerő ábráit!

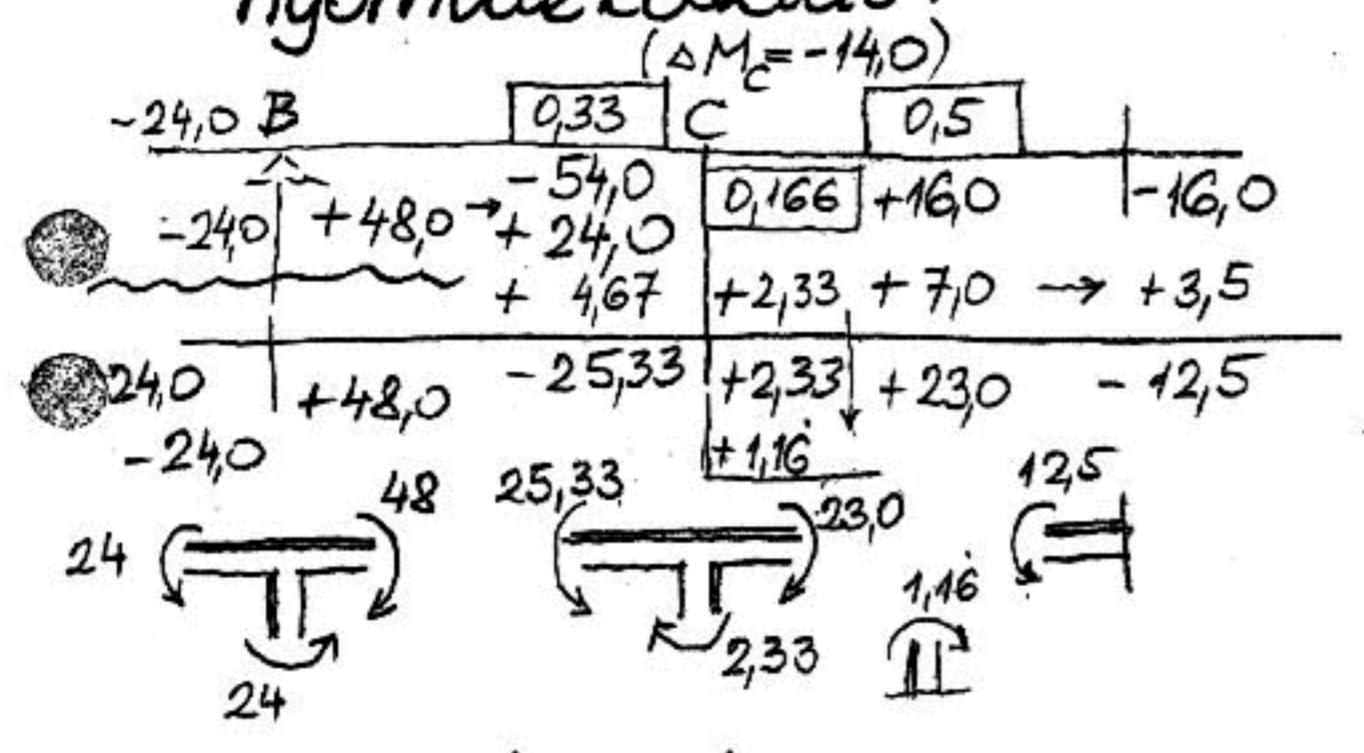


merevségek:
 $k_k = k_1 (!) = 0 (!)$ "A"-görgő!
 $k_2 = \frac{3 \cdot 4}{6} = 2,0$
 $k_3 = \frac{4 \cdot 1}{4} = 1,0$
 $k_4 = \frac{4 \cdot 3}{4} = 3,0$
 $\sum k_c = 6,0$

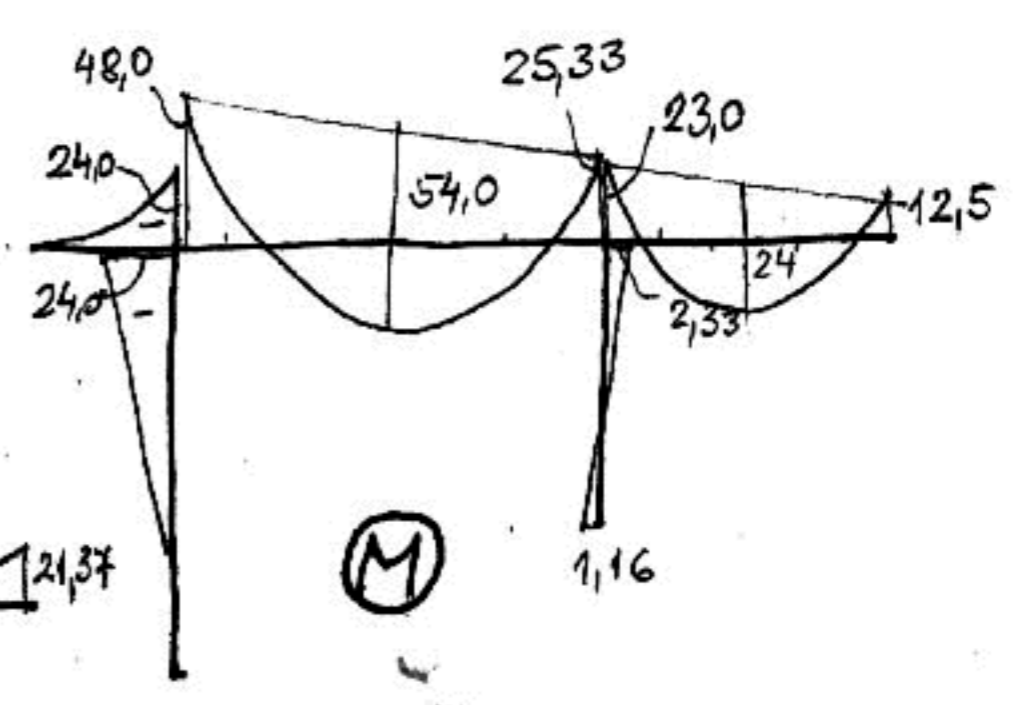
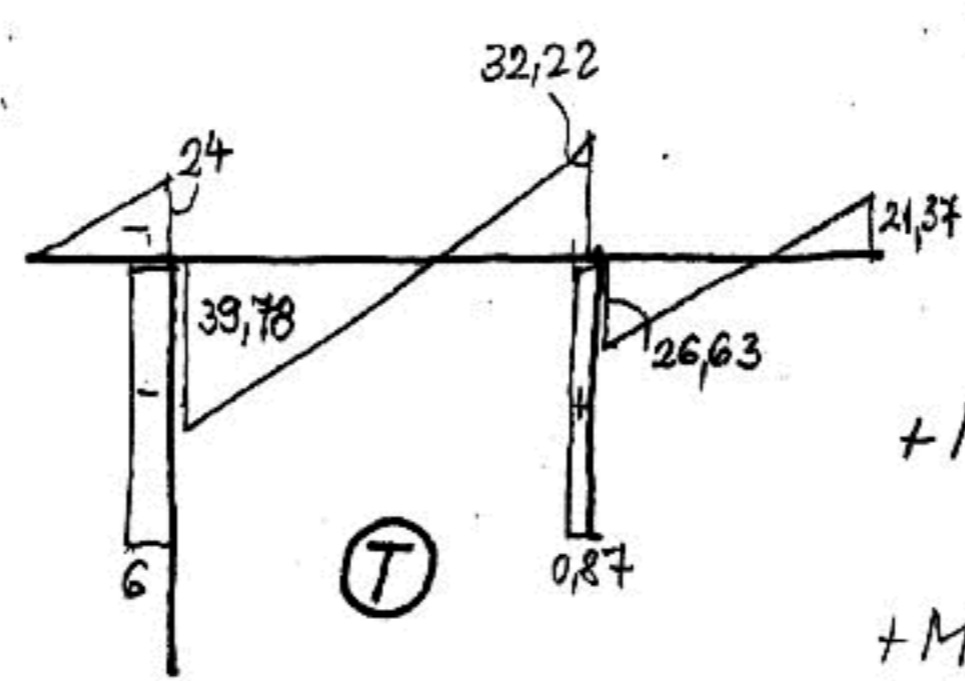
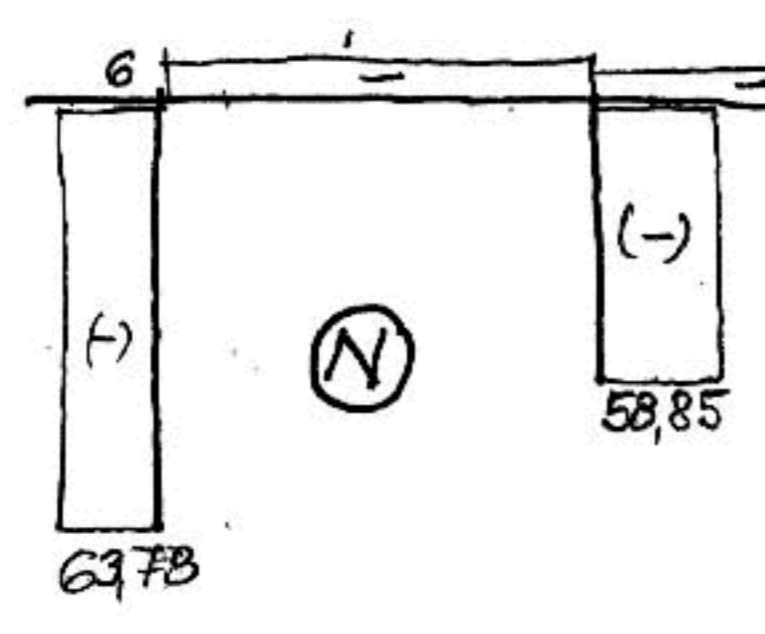
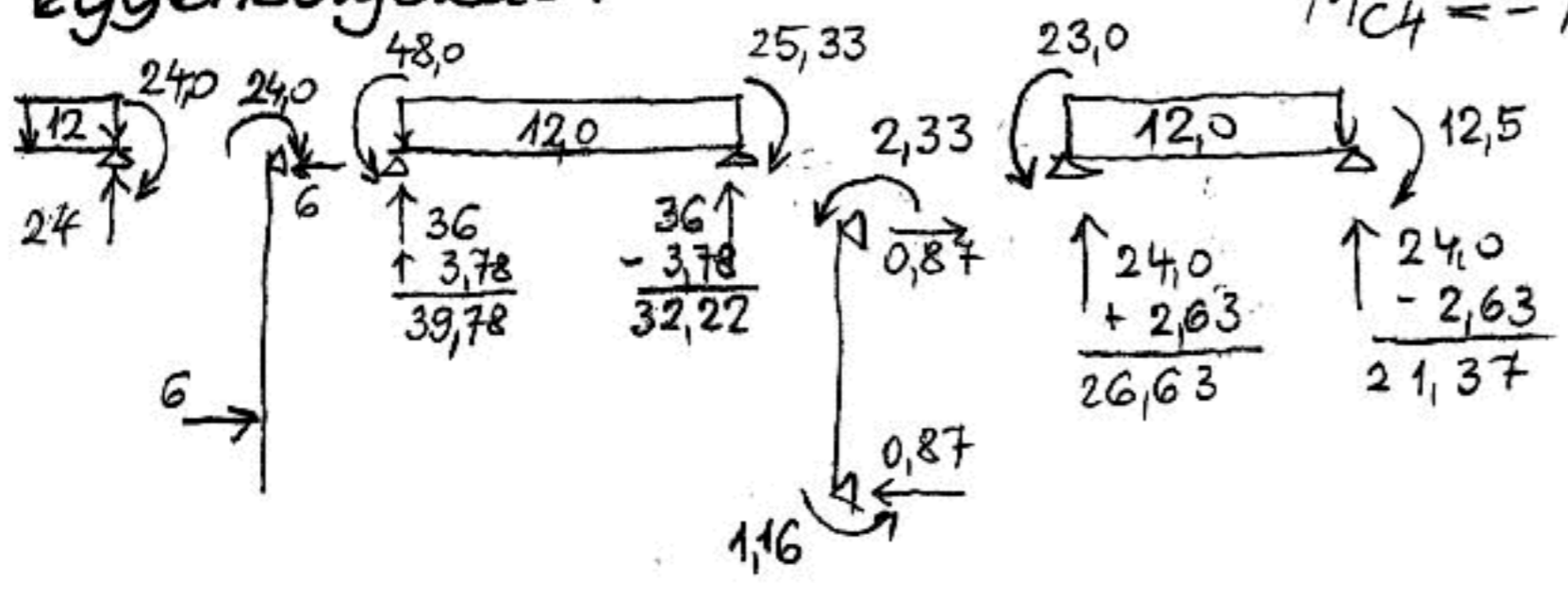
nyomatékosztók:
 $\alpha_{2C} = \frac{2}{6,0} = 0,33$
 $\alpha_{3C} = \frac{1}{6,0} = 0,166$
 $\alpha_{4C} = \frac{3}{6,0} = 0,5$
 $\sum \alpha_c = 1,0$

kezdeti befogási nyomatékok:
 $M_{Bk}^0 = -\frac{1}{2} \cdot 12 \cdot 2^2 = -24,0 \text{ kNm}$
 $M_{B1}^0 = -6,0 \cdot 4 = -24,0 \text{ kNm}$
 $M_{C2}^0 = -\frac{1}{8} \cdot 12 \cdot 6^2 = -54,0 \text{ kNm}$
 $M_{C4} = -M_E = \frac{1}{12} \cdot 12 \cdot 4^2 = +16,0 \text{ kNm}$

nyomatékosztás:



egyensúlyozás:

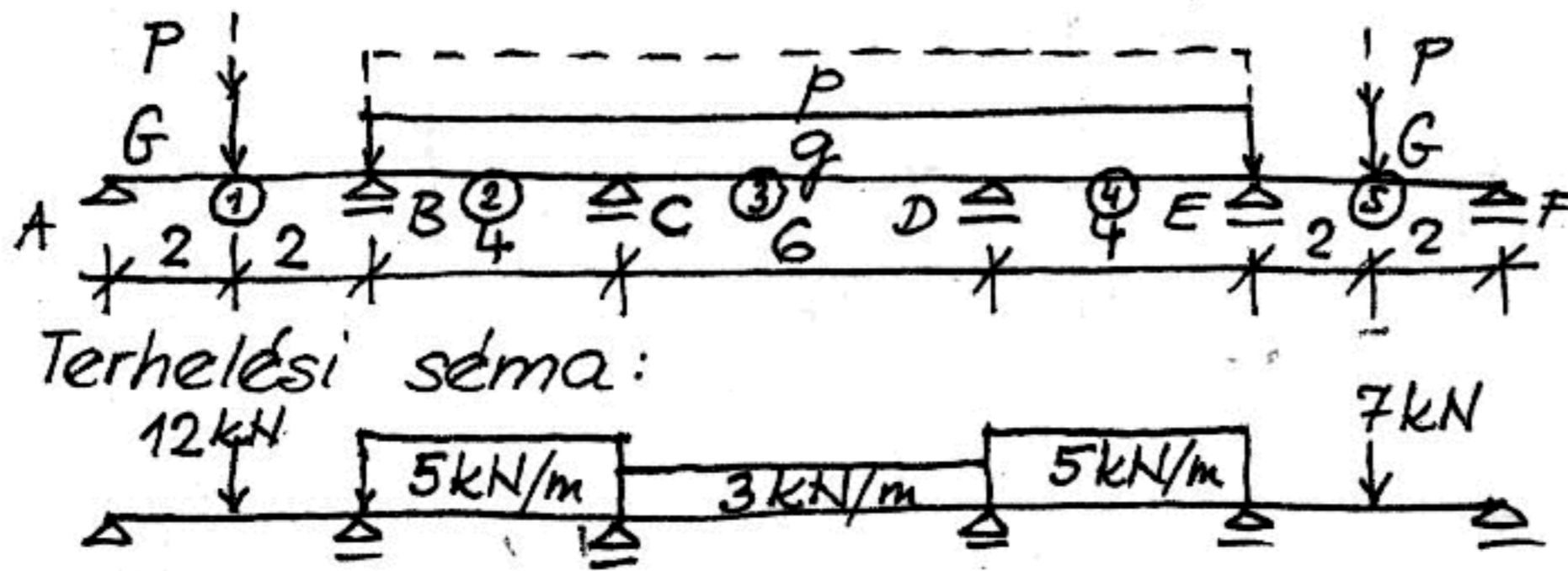


$+M_{max2} = \frac{32,22^2}{2 \cdot 12} - 25,33 = 17,93 \text{ kNm}$
 $+M_{max3} = \frac{21,37^2}{2 \cdot 12} - 12,5 = 6,53 \text{ kNm}$

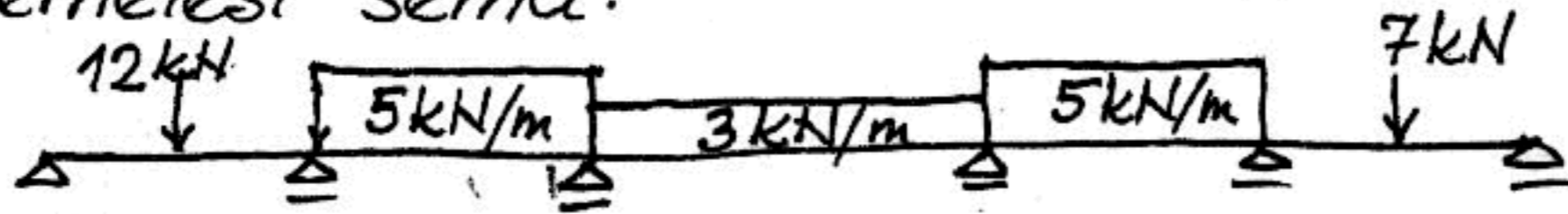
N. 11. évf. T. 8. gyak.

2. pl.: Határozzuk meg a többtámaszú tartó M_{Bmax} értékét! Rajzoljunk M ábrát!

(A páros ill. páratlan belső cs. pontokon felváltva crossolunk!)



Terhelési séma:



$G = 7 \text{ kN}, q = 3 \text{ kN/m}$
 $P = 5 \text{ kN}, p = 2 \text{ kN/m}$

(I-dílandó!)

merevségek:

$k_1 = k_5 = \frac{3 \cdot 1}{4} = 0,75$

$k_2 = k_4 = \frac{4 \cdot 1}{4} = 1,0$

$k_3 = \frac{4 \cdot 1}{6} = 0,66$

ny. osztók:

$\alpha_{1B} = \frac{0,75}{1,75} = 0,43 \quad \alpha_{2B} = 0,57$

$\alpha_{2C} = \frac{1,0}{1,66} = 0,6 \quad \alpha_{3C} = 0,4$

kezdeti bef. nyomatékok:

$M_{B1}^0 = -\frac{3}{16} Fl = -\frac{3}{16} \cdot 12 \cdot 4 = -9,00 \text{ kNm}$

$M_{B2}^0 = -M_{C2}^0 = +\frac{1}{12} \cdot 5 \cdot 4^2 = +6,66 \text{ kNm}$

$M_{C3}^0 = -M_{D3}^0 = +\frac{1}{12} \cdot 3 \cdot 6^2 = +9,0 \text{ kNm}$

$M_{D4}^0 = -M_{E4}^0 = +6,66 \text{ kNm}$

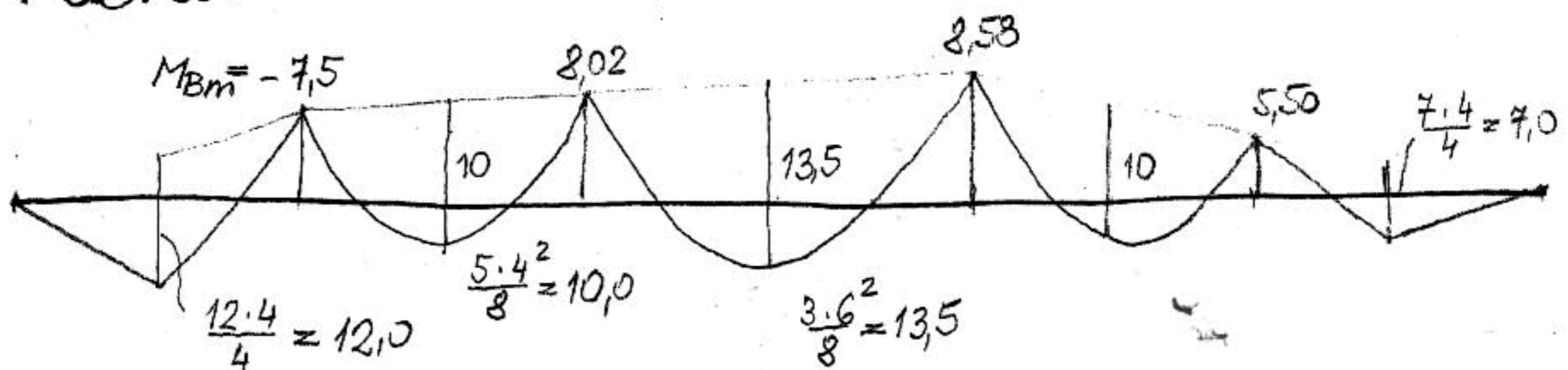
$M_{E5}^0 = +\frac{3}{16} \cdot 7 \cdot 4 = +5,25 \text{ kNm}$

nyomatékosztás:

B		C		D		E	
0,43	0,57	0,6	0,4	0,4	0,6	0,57	0,43
-9,0	+6,66	-6,66	+9,0	-9,0	+6,66	-6,66	+5,25
+1,00	+1,34	→ +0,67	+0,47	← +0,94	+1,40	→ +0,70	
	-1,04	← -2,09	-1,39	→ -0,69	+0,20	← +0,40	+0,31
+0,45	+0,59	→ +0,30	+0,1	← +0,20	+0,29	→ +0,15	
	-0,12	-0,24	-0,16	→ -0,08	-0,04	-0,09	-0,06
+0,05	+0,07	~		~ +0,05	+0,07	~	
-7,50	+7,50	-8,02	+8,02	-8,58	+8,58	-5,50	+5,50

1. lépés: B, D
 2. lépés: C, E
 ...

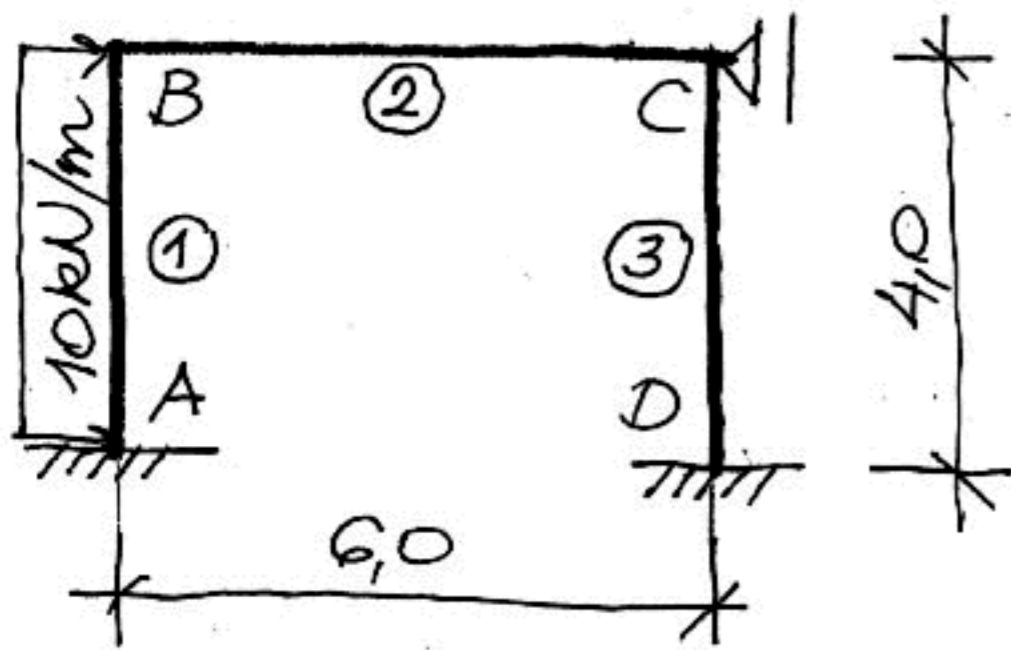
M ábra:



+ gyakorló: $-M_{Cmax} = ?$

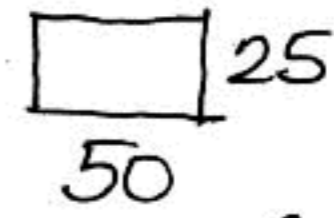
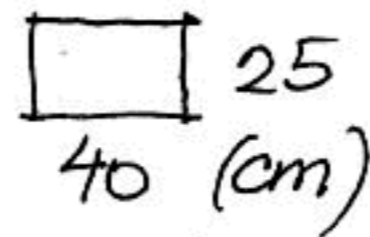
N. 11. évf. T. 8. gyak

3.) Rajzoljuk meg a fix keret M ábráját!



1. és 2. km.:

3. km.:



$$E \text{ (all.)} = 10000 \text{ kN/cm}^2$$

$$I_1 = I_2 = 133.333 \text{ cm}^4$$

$$I_3 = 260417 \text{ cm}^4 = 1.953 I_1$$

merevségek:

$$k_1 = \frac{4 \cdot 1}{4} = 1.0$$

$$\alpha_{B1} = \frac{1}{1.67} = 0.6$$

$$k_2 = \frac{4 \cdot 1}{6} = \frac{2}{3}$$

$$\alpha_{B2} = 0.4$$

$$\alpha_{C2} = \frac{0.67}{2.62} = 0.255$$

$$k_3 = \frac{4 \cdot 1.953}{4} = 1.953$$

$$\alpha_{C3} = 0.745$$

kezdeti bef. nyomatékok:

$$M_{A1}^0 = + \frac{1}{12} \cdot 10 \cdot 4^2 = + 13.33 \text{ kNm} = - M_{B1}^0$$

	0.6		0.255	
		0.4		0.745
-13.33				
+8.0	+5.33	→	+2.67	
		←	-0.68	-1.99
+0.2	-0.34			
	+0.14	→	+0.07	
-5.13	+5.13			
			-0.02	-0.05
			+2.04	-2.04
+13.33				
+4.0				
+0.1				
+17.43				

