

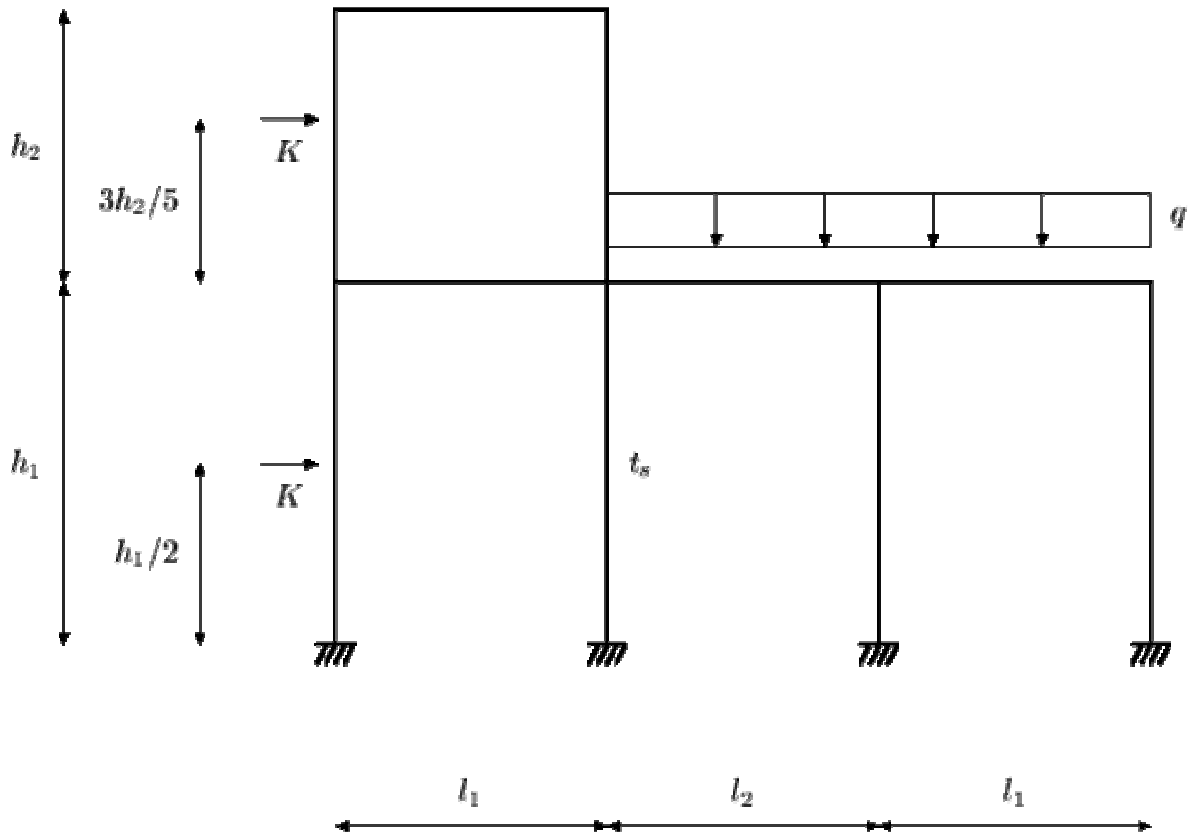
Zadatak 2.

Za zadani sistem kombinacijom metoda Crossa i Werner-Csonke odrediti MT dijagrame.

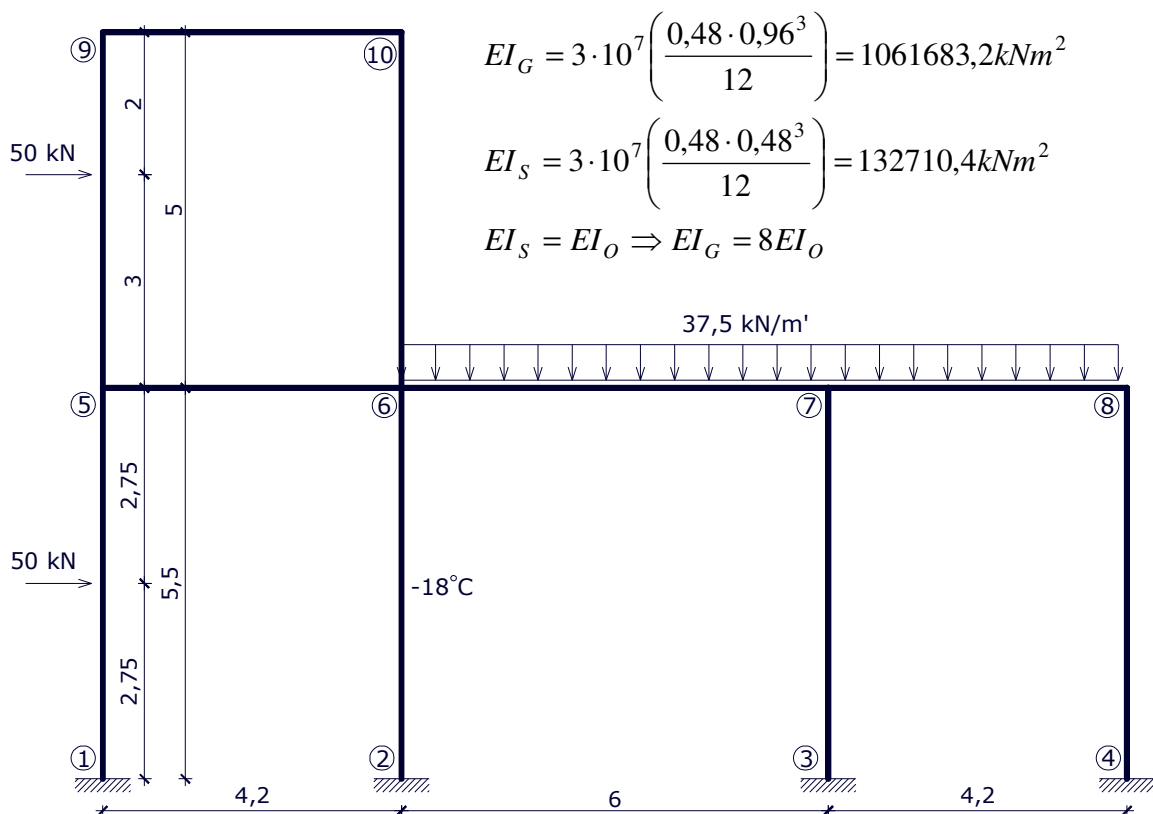
$$E = 3 \cdot 10^7 \text{ kN/m}^2, \quad \alpha_t = 10^{-5} \text{ K}^{-1};$$

grede: $b/h = 48/96$ [cm];

stupovi: $b/h = 48/48$ [cm].

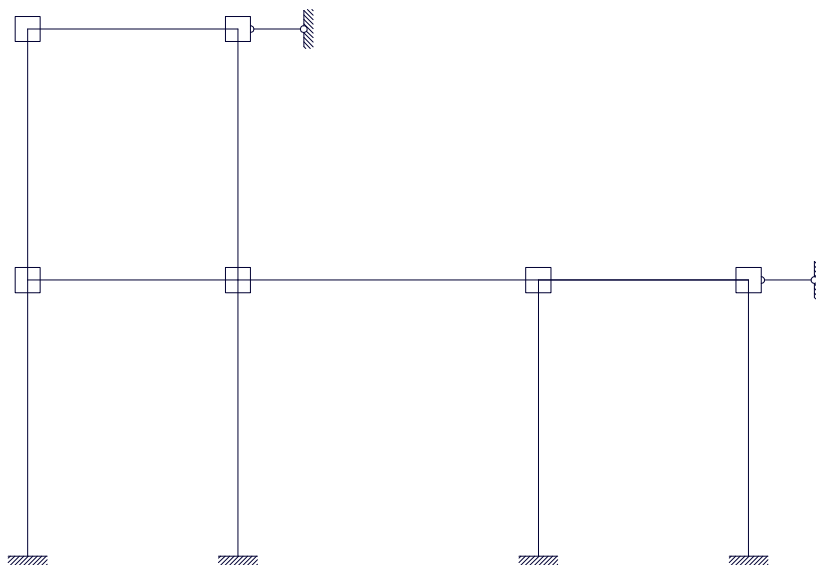


	Student	Zadatak	l_1	l_2	h_1	h_2	q	K	$\delta_{v,h}/\varphi_t/t$
			[m]	[m]	[m]	[m]	[kN/m]	[kN]	[mm]/[m ⁰]/[°C]
31	Vedran Slunjski	2	4.2	6	5.5	5	37.5	50	-18

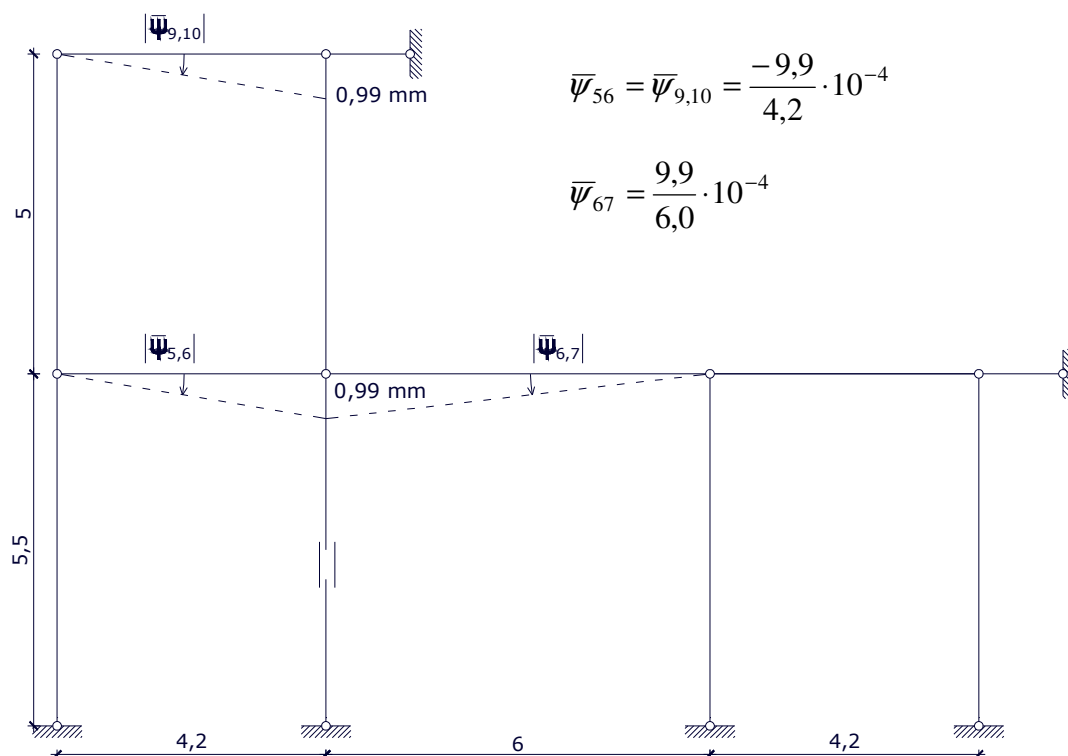


1 CROSS

OSNOVNI SISTEM



PLAN POMAKA OD SKRAĆENJA ZBOG TEMPERATURE



KOEFICJENTI KRUTOSTI ELEMENATA

$$k_{15} = k_{26} = k_{37} = k_{48} = \frac{E \cdot I_0}{5,5}$$

$$k_{59} = k_{6,10} = \frac{E \cdot I_0}{5}$$

$$k_{56} = k_{78} = \frac{8E \cdot I_0}{4,2}$$

$$k_{67} = \frac{8E \cdot I_0}{6}$$

KOEFICJENTI KRUTOSTI ČVOROVA

$$k_5 = k_{15} + k_{56} + k_{59} = 2,29 EI_0$$

$$k_6 = k_{26} + k_{67} + k_{6,10} + k_{56} = 3,62 EI_0$$

$$k_7 = k_{67} + k_{37} + k_{78} = 3,42 EI_0$$

$$k_8 = k_{78} + k_{48} = 2,09 EI_0$$

$$k_9 = k_{59} + k_{9,10} = 2,1 EI_0$$

$$k_{10} = k_{9,10} + k_{6,10} = 2,1 EI_0$$

MOMENTI UPETOSTI

$$\bar{M}_{15} = \frac{50 \cdot 5,5}{8} = 34,4 \text{ kNm}$$

$$\bar{M}_{51} = \frac{-50 \cdot 5,5}{8} = -34,4 \text{ kNm}$$

$$\bar{M}_{56} = -6k_{56}\psi_{56} = 357,5 \text{ kNm}$$

$$\bar{M}_{65} = -6k_{56}\psi_{56} = 357,5 \text{ kNm}$$

$$\bar{M}_{67} = \frac{37,5 \cdot 6,0^2}{12} - 6k_{67}\psi_{67} = -62,7 \text{ kNm}$$

$$\bar{M}_{76} = \frac{-37,5 \cdot 6,0^2}{12} - 6k_{67}\psi_{67} = -287,7 \text{ kNm}$$

$$\bar{M}_{78} = \frac{37,5 \cdot 4,2^2}{12} = 55,1 \text{ kNm}$$

$$\bar{M}_{87} = \frac{-37,5 \cdot 4,2^2}{12} = -55,1 \text{ kNm}$$

$$\bar{M}_{59} = \frac{50 \cdot 3 \cdot 2^2}{5^2} = 24,0 \text{ kNm}$$

$$\bar{M}_{95} = \frac{-50 \cdot 2 \cdot 3^2}{5^2} = -36,0 \text{ kNm}$$

$$\bar{M}_{9,10} = -6k_{56}\psi_{56} = 357,5 \text{ kNm}$$

$$\bar{M}_{10,9} = -6k_{56}\psi_{56} = 357,5 \text{ kNm}$$

RAZDJELNI KOEFICJENTI

Čvor 5

$$\mu_{51} = \frac{k_{15}}{k_5} = \frac{1}{5,5 \cdot 2,28} = 0,08$$

$$\mu_{56} = \frac{k_{56}}{k_5} = \frac{8}{4,2 \cdot 2,28} = 0,83$$

$$\mu_{59} = \frac{k_{59}}{k_5} = \frac{1}{5,0 \cdot 2,28} = 0,09$$

$$\underline{\hspace{10em}} \quad \Sigma = 1$$

Čvor 6

$$\mu_{62} = \frac{k_{62}}{k_6} = \frac{1}{5,5 \cdot 3,62} = 0,05$$

$$\mu_{67} = \frac{k_{67}}{k_6} = \frac{4}{3,0 \cdot 3,62} = 0,37$$

$$\mu_{6,10} = \frac{k_{6,10}}{k_6} = \frac{1}{5,0 \cdot 3,62} = 0,06$$

$$\mu_{65} = \frac{k_{56}}{k_6} = \frac{8}{4,2 \cdot 3,62} = 0,52$$

$$\Sigma = 1$$

Čvor 7

$$\mu_{76} = \frac{k_{67}}{k_7} = \frac{4}{3,0 \cdot 3,42} = 0,39$$

$$\mu_{73} = \frac{k_{37}}{k_7} = \frac{1}{5,5 \cdot 3,42} = 0,05$$

$$\mu_{78} = \frac{k_{78}}{k_7} = \frac{8}{4,2 \cdot 3,42} = 0,56$$

$$\Sigma = 1$$

Čvor 8

$$\mu_{87} = \frac{k_{78}}{k_8} = \frac{8}{4,2 \cdot 2,09} = 0,91$$

$$\mu_{84} = \frac{k_{48}}{k_8} = \frac{1}{5,5 \cdot 2,09} = 0,09$$

$$\Sigma = 1$$

Čvor 9

$$\mu_{95} = \frac{k_{59}}{k_9} = \frac{1}{5,0 \cdot 2,1} = 0,09$$

$$\mu_{9,10} = \frac{k_{9,10}}{k_9} = \frac{8}{4,2 \cdot 2,1} = 0,91$$

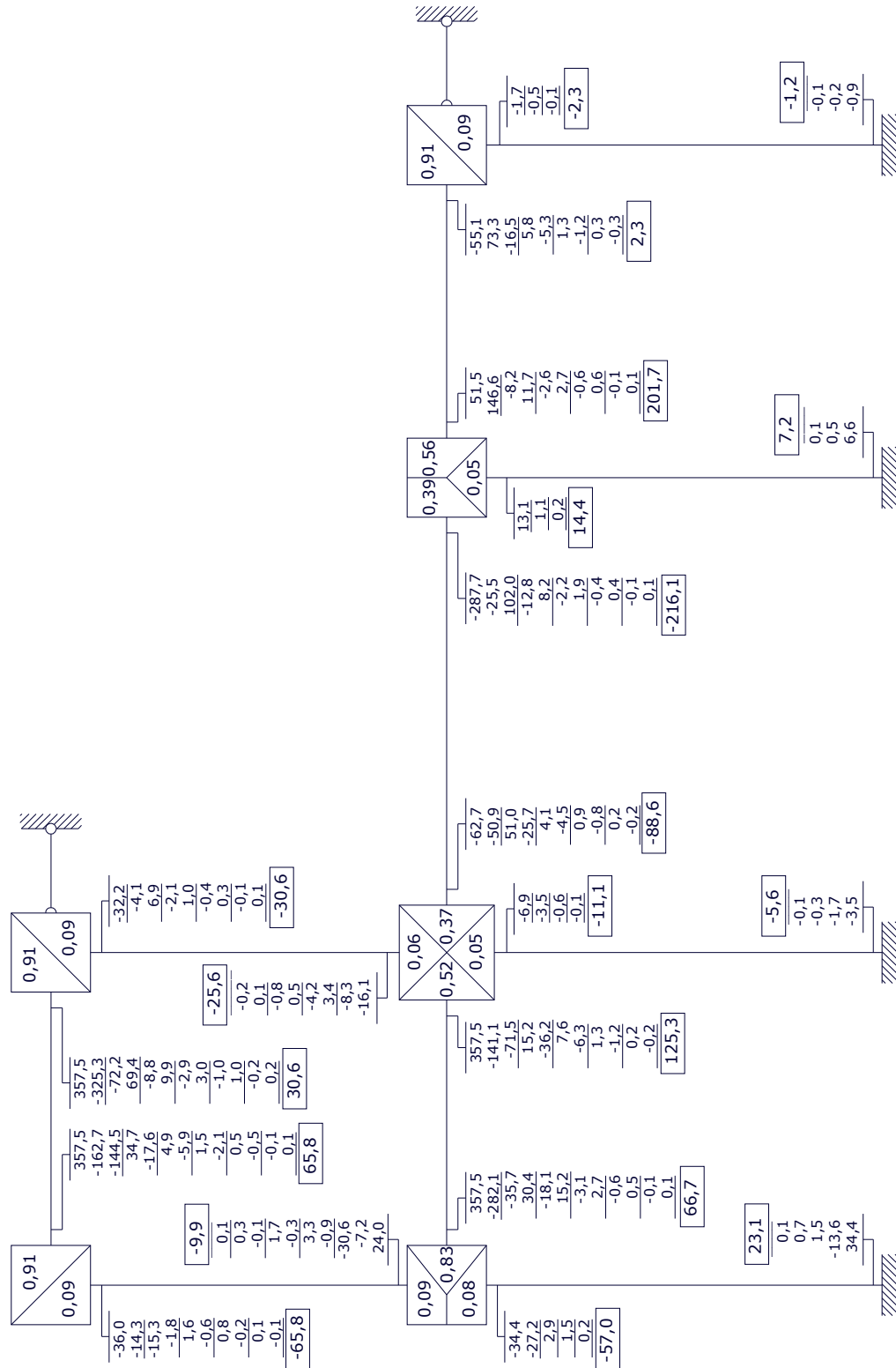
$$\Sigma = 1$$

Čvor 10

$$\mu_{10,6} = \frac{k_{69}}{k_{10}} = \frac{1}{5,0 \cdot 2,1} = 0,09$$

$$\mu_{10,9} = \frac{k_{9,10}}{k_9} = \frac{8}{4,2 \cdot 2,1} = 0,91$$

$$\Sigma = 1$$



1. ITERACIJA

Čvor 10

$$\begin{aligned} \Delta M &= 357,5 \\ -0,91 \cdot 357,5 &= -325,3 \\ -0,09 \cdot 357,5 &= -32,2 \\ \hline \Sigma &= -357,5 \end{aligned}$$

Čvor 9

$$\begin{aligned} \Delta M &= 357,5 - 162,7 - 36 \\ \Delta M &= 158,8 \\ -0,91 \cdot 158,8 &= -144,5 \\ -0,09 \cdot 158,8 &= -14,3 \\ \hline \Sigma &= -158,8 \end{aligned}$$

Čvor 5

$$\begin{aligned} \Delta M &= -7,2 + 24 + 357,5 - 34,4 \\ \Delta M &= 339,9 \\ -0,09 \cdot 339,9 &= -30,6 \\ -0,83 \cdot 339,9 &= -282,1 \\ -0,08 \cdot 339,9 &= -27,2 \\ \hline \Sigma &= -339,9 \end{aligned}$$

Čvor 6

$$\begin{aligned} \Delta M &= 357,5 - 141,1 - 62,7 - 16,1 \\ \Delta M &= 137,6 \\ -0,06 \cdot 137,6 &= -8,3 \\ -0,37 \cdot 137,6 &= -50,9 \\ -0,05 \cdot 137,6 &= -6,9 \\ -0,52 \cdot 137,6 &= -71,5 \\ \hline \Sigma &= -137,6 \end{aligned}$$

Čvor 7

$$\begin{aligned} \Delta M &= -25,5 - 287,7 + 51,5 \\ \Delta M &= -261,7 \\ 0,56 \cdot 261,7 &= 146,6 \\ 0,05 \cdot 261,7 &= 13,1 \\ 0,39 \cdot 261,7 &= 102,0 \\ \hline \Sigma &= 261,7 \end{aligned}$$

Čvor 8

$$\begin{aligned} \Delta M &= 73,3 - 55,1 = 18,2 \\ -0,91 \cdot 18,2 &= -16,5 \\ -0,09 \cdot 18,2 &= -1,7 \\ \hline \Sigma &= -18,2 \end{aligned}$$

2. ITERACIJA

Čvor 10

$$\begin{aligned} \Delta M &= -72,2 - 4,1 = -76,3 \\ 0,91 \cdot 76,3 &= 69,4 \\ 0,09 \cdot 76,3 &= 6,9 \\ \hline \Sigma &= 76,3 \end{aligned}$$

Čvor 9

$$\begin{aligned} \Delta M &= 34,7 - 15,3 = 19,4 \\ -0,91 \cdot 19,4 &= -17,6 \\ -0,09 \cdot 19,4 &= -1,8 \\ \hline \Sigma &= -19,4 \end{aligned}$$

Čvor 5

$$\begin{aligned} \Delta M &= -0,9 - 35,7 = -36,6 \\ 0,09 \cdot 36,6 &= 3,3 \\ 0,83 \cdot 36,6 &= 30,4 \\ 0,08 \cdot 36,6 &= 2,9 \\ \hline \Sigma &= 36,6 \end{aligned}$$

Čvor 6

$$\begin{aligned} \Delta M &= 15,2 + 51 + 3,4 = 69,6 \\ -0,06 \cdot 69,6 &= -4,2 \\ -0,37 \cdot 69,6 &= -25,7 \\ -0,05 \cdot 69,6 &= -3,5 \\ -0,52 \cdot 69,6 &= -36,2 \\ \hline \Sigma &= -69,6 \end{aligned}$$

Čvor 7

$$\begin{aligned} \Delta M &= -12,8 - 8,2 = -21 \\ 0,56 \cdot 21 &= 11,7 \\ 0,05 \cdot 21 &= 1,1 \\ 0,39 \cdot 21 &= 8,2 \\ \hline \Sigma &= 21 \end{aligned}$$

Čvor 8

$$\begin{aligned} \Delta M &= 5,8 \\ -0,91 \cdot 5,8 &= -5,3 \\ -0,09 \cdot 5,8 &= -0,5 \\ \hline \Sigma &= -5,8 \end{aligned}$$

3. ITERACIJA
Čvor 10

$$\Delta M = -8,8 - 2,1 = -10,9$$

$$0,91 \cdot 10,9 = 9,9$$

$$0,09 \cdot 10,9 = 1,0$$

$$\Sigma = 10,9$$

Čvor 9

$$\Delta M = 4,9 + 1,6 = 6,5$$

$$-0,91 \cdot 6,5 = -5,9$$

$$-0,09 \cdot 6,5 = -0,6$$

$$\Sigma = -6,5$$

Čvor 5

$$\Delta M = -0,3 - 18,1 = -18,4$$

$$0,09 \cdot 18,4 = 1,7$$

$$0,83 \cdot 18,4 = 15,2$$

$$0,08 \cdot 18,4 = 1,5$$

$$\Sigma = 18,4$$

Čvor 6

$$\Delta M = 0,5 + 4,1 + 7,6 = 12,2$$

$$-0,06 \cdot 12,2 = -0,8$$

$$-0,37 \cdot 12,2 = -4,5$$

$$-0,05 \cdot 12,2 = -0,6$$

$$-0,52 \cdot 12,2 = -6,3$$

$$\Sigma = -12,2$$

Čvor 7

$$\Delta M = -2,2 - 2,6 = -4,8$$

$$0,56 \cdot 4,8 = 2,7$$

$$0,05 \cdot 4,8 = 0,2$$

$$0,39 \cdot 4,8 = 1,9$$

$$\Sigma = 4,8$$

Čvor 8

$$\Delta M = 1,3$$

$$-0,91 \cdot 1,3 = -1,2$$

$$-0,09 \cdot 1,3 = -0,1$$

$$\Sigma = -1,3$$

4. ITERACIJA
Čvor 10

$$\Delta M = -2,9 - 0,4 = -3,3$$

$$0,91 \cdot 3,3 = 3,0$$

$$0,09 \cdot 3,3 = 0,3$$

$$\Sigma = 3,3$$

Čvor 9

$$\Delta M = 1,5 + 0,8 = 2,3$$

$$-0,91 \cdot 2,3 = -2,1$$

$$-0,09 \cdot 2,3 = -0,2$$

$$\Sigma = -2,3$$

Čvor 5

$$\Delta M = -0,1 - 3,1 = -3,2$$

$$0,09 \cdot 3,2 = 0,3$$

$$0,83 \cdot 3,2 = 2,7$$

$$0,08 \cdot 3,2 = 0,2$$

$$\Sigma = 3,2$$

Čvor 6

$$\Delta M = 0,1 + 0,9 + 1,3 = 2,3$$

$$-0,06 \cdot 2,3 = -0,2$$

$$-0,37 \cdot 2,3 = -0,8$$

$$-0,05 \cdot 2,3 = -0,1$$

$$-0,52 \cdot 2,3 = -1,2$$

$$\Sigma = -2,3$$

Čvor 7

$$\Delta M = -0,4 - 0,6 = -1,0$$

$$0,56 \cdot 1 = 0,6$$

$$0,05 \cdot 1 = 0,0$$

$$0,39 \cdot 1 = 0,4$$

$$\Sigma = 1$$

5. ITERACIJA

Čvor 10

$$\Delta M = -1,0 - 0,1 = -1,1$$

$$0,91 \cdot 1,1 = 1,0$$

$$0,09 \cdot 1,1 = 0,1$$

$$\underline{\Sigma = 1,1}$$

Čvor 9

$$\Delta M = 0,5 + 0,1 = 0,6$$

$$-0,91 \cdot 0,6 = -0,5$$

$$-0,09 \cdot 0,6 = -0,1$$

$$\underline{\Sigma = -0,6}$$

Čvor 5

$$\Delta M = -0,6$$

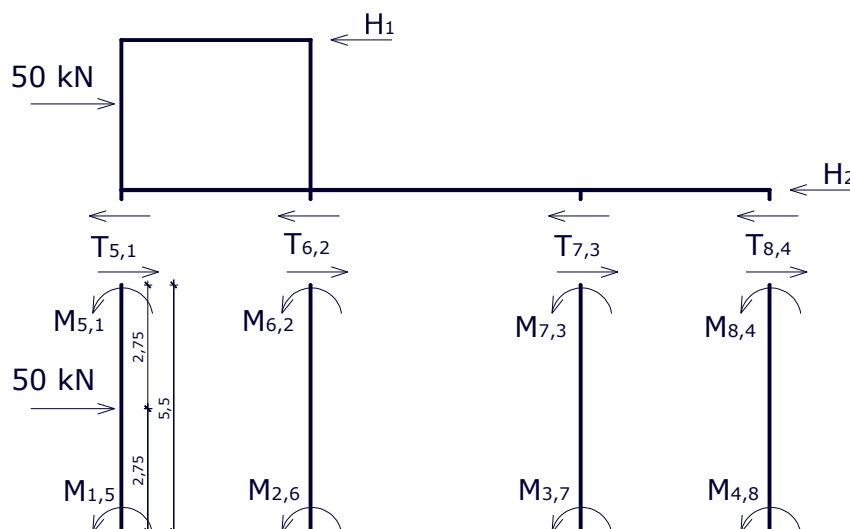
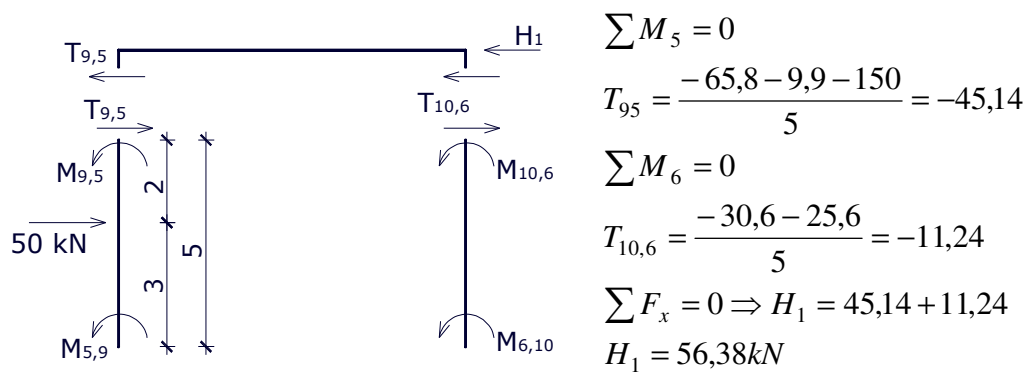
$$0,09 \cdot 0,6 = 0,1$$

$$0,83 \cdot 0,6 = 0,5$$

$$0,08 \cdot 0,6 = 0$$

$$\underline{\Sigma = 0,6}$$

ODREĐIVANJE REAKCIJA U PRIDRŽANJIMA



$$\sum M_1 = 0 \Rightarrow T_{51} = \frac{23,1 - 57 - 50 \cdot 2,75}{5,5} = -31,16 \text{ kN}$$

$$\sum M_2 = 0 \Rightarrow T_{62} = \frac{-5,6 - 11,1}{5,5} = -3,04 \text{ kN}$$

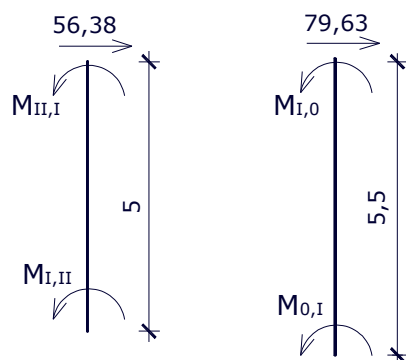
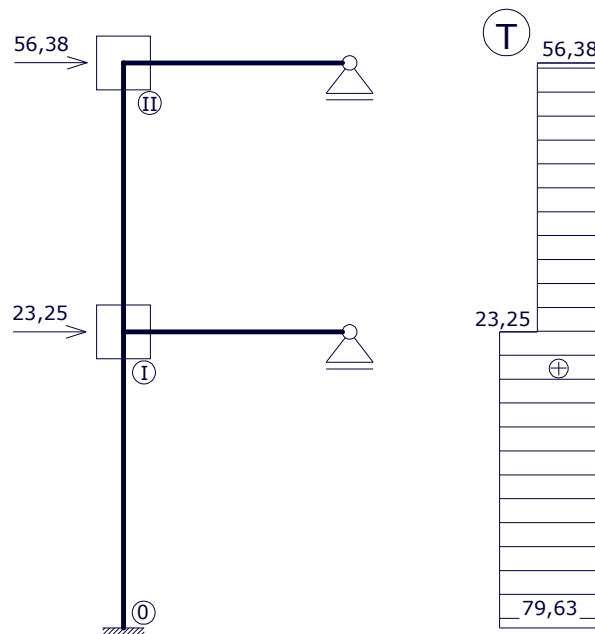
$$\sum M_3 = 0 \Rightarrow T_{73} = \frac{7,2 + 14,4}{5,5} = 3,93 \text{ kN}$$

$$\sum M_4 = 0 \Rightarrow T_{84} = \frac{-1,2 - 2,3}{5,5} = -0,64 \text{ kN}$$

$$\sum F_x = 0 \Rightarrow H_2 = -56,38 + 50 + 31,16 + 3,04 - 3,93 + 0,64 = 23,25 \text{ kN}$$

2 WERNER – CSONKA

ZAMJENJUJUĆI POLUOKVIR



$$M_{I,II} = M_{II,I} = \frac{56,38 \cdot 5}{2} = 140,95 \text{ kNm}$$

$$M_{0,I} = M_{I,0} = \frac{79,63 \cdot 5,5}{2} = 219 \text{ kNm}$$

KOEFICJENTI KRUTOSTI ELEMENATA

Stupova:

$$k_{0I} = k_{15} + k_{26} + k_{37} + k_{48} = \frac{4EI_0}{5,5}$$

$$k_{I,II} = k_{59} + k_{6,10} = \frac{2EI_0}{5,0}$$

Greda:

$$k_{IG} = 4k_{56} + 4k_{67} + 4k_{78} = \frac{64,8EI_0}{12,6}$$

$$k_{II G} = 4k_{9,10} = \frac{32EI_0}{4,2}$$

KOEFICJENTI KRUTOSTI ČVOROVA

$$k_I = 3k_{IG} + k_{0I} + k_{I,II} = 16,56EI_0$$

$$k_{II} = 3k_{II G} + k_{I,II} = 23,26EI_0$$

RAZDJELNI KOEFICJENTI

Čvor 1

$$\mu_{I0} = \frac{k_{0I}}{k_I} = \frac{4}{5,5 \cdot 16,56} = 0,05$$

$$\mu_{IG} = \frac{3k_{IG}}{k_I} = \frac{36,48}{12,6 \cdot 16,56} = 0,93$$

$$\mu_{I,II} = \frac{k_{I,II}}{k_I} = \frac{2}{5,0 \cdot 16,56} = 0,02$$

$$\Sigma = 1$$

Čvor 2

$$\mu_{II,I} = \frac{k_{I,II}}{k_{II}} = \frac{2}{5,0 \cdot 23,26} = 0,02$$

$$\mu_{II,G} = \frac{3k_{II,G}}{k_{II}} = \frac{3 \cdot 32}{4,2 \cdot 23,26} = 0,98$$

$$\Sigma = 1$$

1. ITERACIJA

Čvor I

$$\Delta M = 140,95 + 219 = 360$$

$$-0,02 \cdot 360 = -7,2$$

$$-0,93 \cdot 360 = -334,8$$

$$-0,05 \cdot 360 = -18$$

$$\Sigma = -360$$

Čvor II

$$\Delta M = 140,95 + 7,2 = 148,2$$

$$-0,98 \cdot 148,2 = -145,2$$

$$-0,02 \cdot 148,2 = -3,0$$

$$\Sigma = -148,2$$

2. ITERACIJA

Čvor I

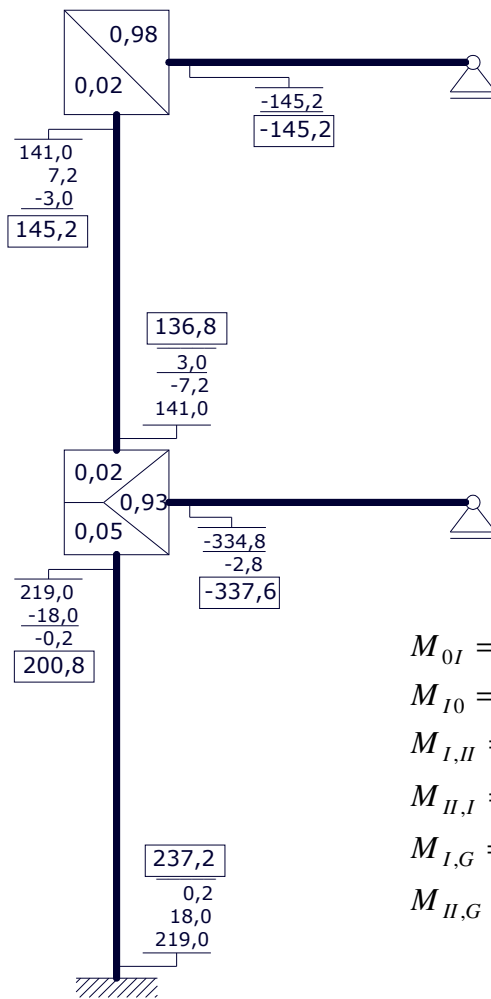
$$\Delta M = 3,0$$

$$-0,02 \cdot 3 = 0$$

$$-0,93 \cdot 3 = -2,8$$

$$-0,05 \cdot 3 = -0,2$$

$$\Sigma = -3$$



$$M_{0I} = M_{15} + M_{26} + M_{37} + M_{48} = 237,5kNm$$

$$M_{I0} = M_{51} + M_{62} + M_{73} + M_{84} = 200,8kNm$$

$$M_{I,II} = M_{59} + M_{6,10} = 136,8kNm$$

$$M_{II,I} = M_{95} + M_{10,6} = 145,2kNm$$

$$M_{I,G} = M_{56} + M_{65} + M_{67} + M_{76} + M_{78} + M_{87} = -337,6kNm$$

$$M_{II,G} = M_{9,10} + M_{10,9} = -145,2kNm$$

$$M_{15} = M_{26} = M_{37} = M_{48} = \frac{237,5}{4} = 59,4kNm$$

$$M_{51} = M_{62} = M_{73} = M_{84} = \frac{200,8}{4} = 50,2kNm$$

$$M_{59} = M_{6,10} = \frac{136,8}{2} = 68,4kNm$$

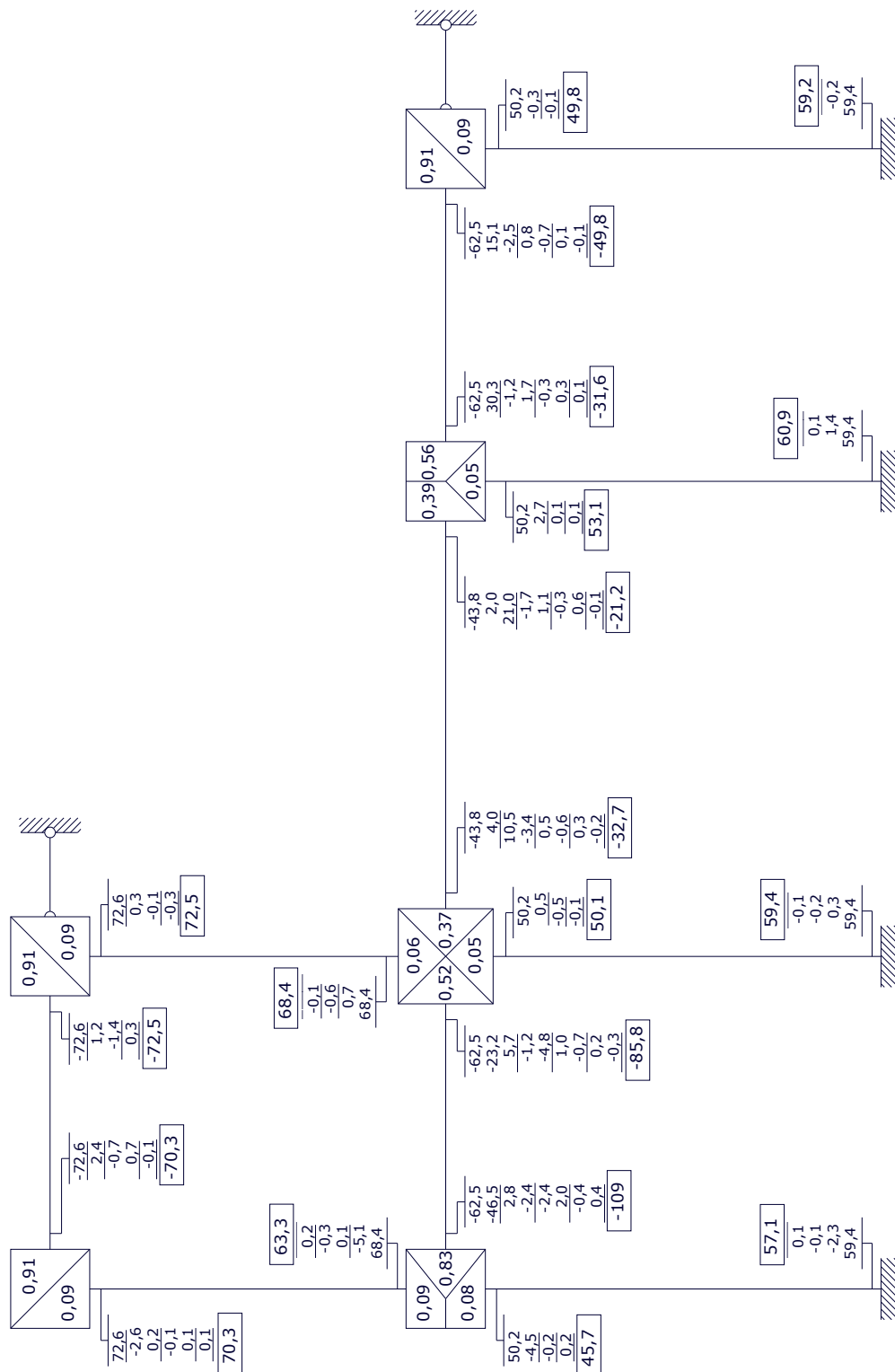
$$M_{95} = M_{10,6} = \frac{145,2}{2} = 72,6kNm$$

$$M_{56} = M_{65} = \frac{k_{56}}{2(k_{56} + k_{67} + k_{78})} \cdot (-337,6) = -62,5kNm$$

$$M_{67} = M_{76} = \frac{k_{67}}{2(k_{56} + k_{67} + k_{78})} \cdot (-337,6) = -43,8kNm$$

$$M_{78} = M_{87} = \frac{k_{78}}{2(k_{56} + k_{67} + k_{78})} \cdot (-337,6) = -62,5kNm$$

$$M_{9,10} = M_{10,9} = \frac{-145,2}{2} = -72,6kNm$$



1. ITERACIJA

Čvor 5

$$\Delta M = 68,4 - 62,5 + 50,2$$

$$\Delta M = 56,1$$

$$-0,09 \cdot 56,1 = -5,1$$

$$-0,83 \cdot 56,1 = -46,5$$

$$-0,08 \cdot 56,1 = -4,5$$

$$\Sigma = -56,1$$

Čvor 6

$$\Delta M = 68,4 - 43,8 + 50,2 - 62,5 - 23,2$$

$$\Delta M = -10,9$$

$$0,06 \cdot 10,9 = 0,7$$

$$0,37 \cdot 10,9 = 4,0$$

$$0,05 \cdot 10,9 = 0,5$$

$$0,52 \cdot 10,9 = 5,7$$

$$\Sigma = 10,9$$

Čvor 7

$$\Delta M = -43,8 + 2 + 50,2 - 62,5$$

$$\Delta M = -54,1$$

$$0,56 \cdot 54,1 = 30,3$$

$$0,05 \cdot 54,1 = 2,7$$

$$0,39 \cdot 54,1 = 21,1$$

$$\Sigma = 54,1$$

Čvor 8

$$\Delta M = -62,5 + 15,1 + 50,2 = 2,8$$

$$-0,91 \cdot 2,8 = -2,5$$

$$-0,09 \cdot 2,8 = -0,3$$

$$\Sigma = -2,8$$

Čvor 9

$$\Delta M = -2,6$$

$$0,91 \cdot 2,6 = 2,4$$

$$0,09 \cdot 2,6 = 0,2$$

$$\Sigma = 2,6$$

Čvor 10

$$\Delta M = 1,2 + 0,3 = 1,5$$

$$-0,91 \cdot 1,5 = -1,4$$

$$-0,09 \cdot 1,5 = -0,1$$

$$\Sigma = -1,5$$

2. ITERACIJA
Čvor 5

$$\Delta M = 0,1 + 2,8 = 2,9$$

$$-0,09 \cdot 2,9 = -0,3$$

$$-0,83 \cdot 2,9 = -2,4$$

$$-0,08 \cdot 2,9 = -0,2$$

$$\Sigma = -2,9$$

Čvor 6

$$\Delta M = 10,5 - 1,2 = 9,3$$

$$-0,06 \cdot 9,3 = -0,6$$

$$-0,37 \cdot 9,3 = -3,4$$

$$-0,05 \cdot 9,3 = -0,5$$

$$-0,52 \cdot 9,3 = -4,8$$

$$\Sigma = -9,3$$

Čvor 7

$$\Delta M = -1,7 - 1,2 = -2,9$$

$$0,56 \cdot 2,9 = 1,7$$

$$0,05 \cdot 2,9 = 0,1$$

$$0,39 \cdot 2,9 = 1,1$$

$$\Sigma = 2,9$$

Čvor 8

$$\Delta M = 0,8$$

$$-0,91 \cdot 0,8 = -0,7$$

$$-0,09 \cdot 0,8 = -0,1$$

$$\Sigma = -0,8$$

Čvor 9

$$\Delta M = -0,1 - 0,7 = -0,8$$

$$0,91 \cdot 0,8 = 0,7$$

$$0,09 \cdot 0,8 = 0,1$$

$$\Sigma = 0,8$$

3. ITERACIJA
Čvor 5

$$\Delta M = -2,4$$

$$0,09 \cdot 2,4 = 0,2$$

$$0,83 \cdot 2,4 = 2,0$$

$$0,08 \cdot 2,4 = 0,2$$

$$\Sigma = 2,4$$

Čvor 6

$$\Delta M = 1,0 + 0,5 = 1,5$$

$$-0,06 \cdot 1,5 = -0,1$$

$$-0,37 \cdot 1,5 = -0,6$$

$$-0,05 \cdot 1,5 = -0,1$$

$$-0,52 \cdot 1,5 = -0,7$$

$$\Sigma = -1,5$$

Čvor 7

$$\Delta M = -0,6$$

$$0,56 \cdot 0,5 = 0,3$$

$$0,05 \cdot 0,5 = 0,1$$

$$0,39 \cdot 0,5 = 0,2$$

$$\Sigma = 0,6$$

POPREČNE SILE – nakon 2 Cross-a

$$T'_{95} = \frac{70,3 + 63,3}{5} = 26,7 \text{ kN}$$

$$T'_{10,6} = \frac{72,5 + 68,4}{5} = 28,2 \text{ kN}$$

$$T'_{II,I} = 26,7 + 28,2 = 54,9$$

$$T'_{51} = \frac{45,7 + 57,1}{5,5} = 18,7 \text{ kN}$$

$$T'_{6,2} = \frac{50,1 + 59,4}{5,5} = 19,9 \text{ kN}$$

$$T'_{73} = \frac{53,1 + 60,9}{5,5} = 20,7 \text{ kN}$$

$$T'_{84} = \frac{59,2 + 49,8}{5,5} = 19,8 \text{ kN}$$

$$T'_{I,0} = 18,7 + 19,9 + 20,7 + 19,8 = 79,1 \text{ kN}$$

$$\Delta T_{II,I} = T_{II,I} - T'_{II,I} = 1,5(+)$$

$$\Delta T_{I,0} = T_{I,0} - T'_{I,0} = 0,5(+)$$
 obje su(+)

KOEFICJENT α

$$\alpha = \frac{T_{II,I} \cdot h_{I,II} + T_{I,0} \cdot h_{I,0}}{T'_{II,I} \cdot h_{I,II} + T'_{I,0} \cdot h_{I,II}} = \frac{56,4 \cdot 5,0 + 79,6 \cdot 5,5}{54,9 \cdot 5,0 + 79,1 \cdot 5,5} = 1,01$$

KONAČNI MOMENTI

$$M = M_{CR1} + \alpha M_{CR2}$$

$$M_{15} = 23,1 + 1,01 \cdot 57,1 = 80,8 \text{ kNm}$$

$$M_{51} = -57,0 + 1,01 \cdot 45,7 = -10,8 \text{ kNm}$$

$$M_{26} = -5,6 + 1,01 \cdot 59,4 = 54,4 \text{ kNm}$$

$$M_{62} = -11,1 + 1,01 \cdot 50,1 = 39,5 \text{ kNm}$$

$$M_{37} = 7,2 + 1,01 \cdot 60,9 = 68,7 \text{ kNm}$$

$$M_{73} = 14,4 + 1,01 \cdot 53,1 = 68,0 \text{ kNm}$$

$$M_{48} = -1,2 + 1,01 \cdot 59,2 = 58,6 \text{ kNm}$$

$$M_{84} = -2,3 + 1,01 \cdot 49,8 = 48,0 \text{ kNm}$$

$$M_{59} = -9,9 + 1,01 \cdot 63,3 = 54,0 \text{ kNm}$$

$$M_{95} = -65,8 + 1,01 \cdot 70,3 = 5,2 \text{ kNm}$$

$$M_{6,10} = -25,6 + 1,01 \cdot 68,4 = 43,5 \text{ kNm}$$

$$M_{10,6} = -30,6 + 1,01 \cdot 72,5 = 42,6 \text{ kNm}$$

$$M_{56} = 66,7 - 1,01 \cdot 109 = -43,4 \text{ kNm}$$

$$M_{65} = 125,3 - 1,01 \cdot 85,8 = 38,6 \text{ kNm}$$

$$M_{67} = -88,6 - 1,01 \cdot 32,7 = -121,6 \text{ kNm}$$

$$M_{76} = -216,1 - 1,01 \cdot 21,2 = -237,5 \text{ kNm}$$

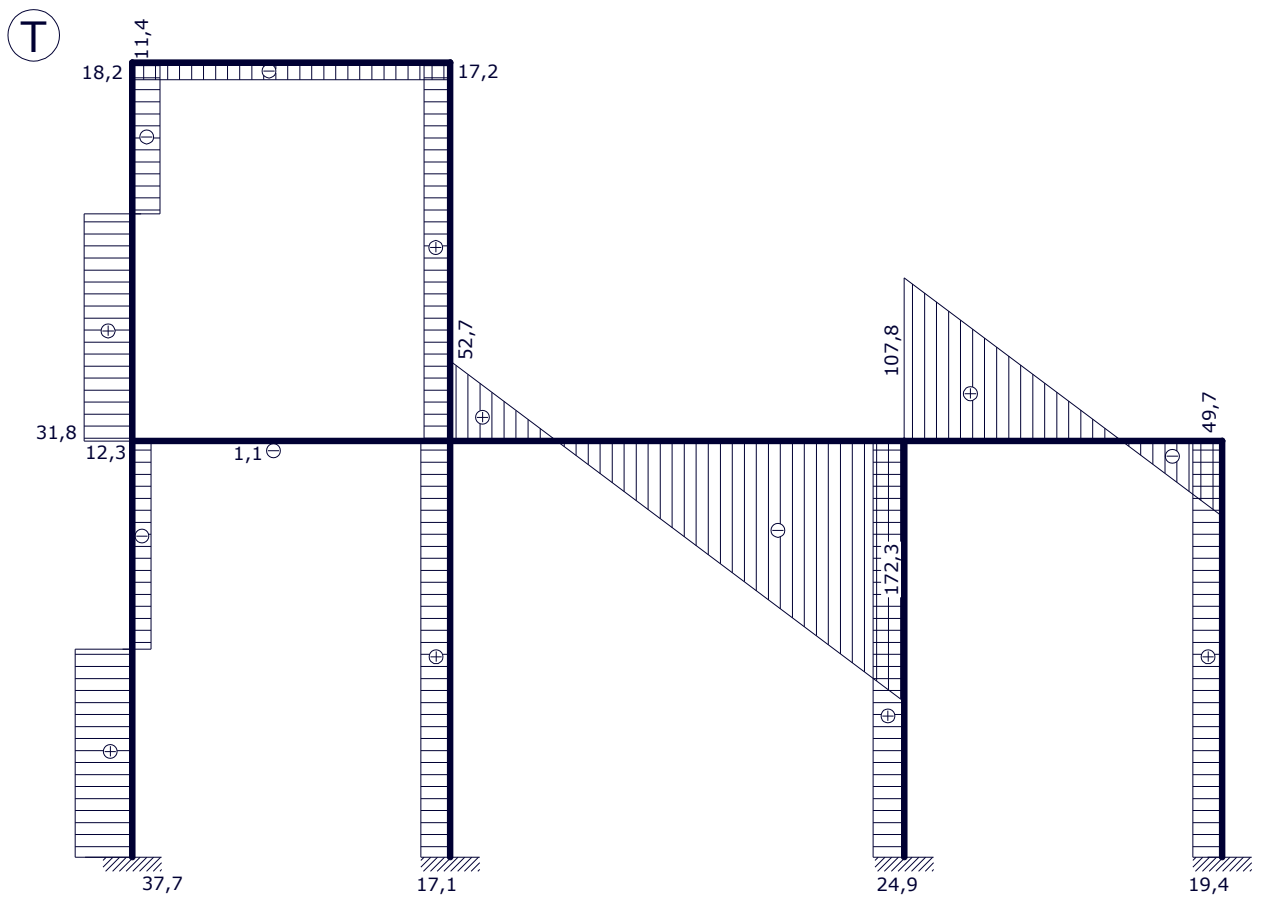
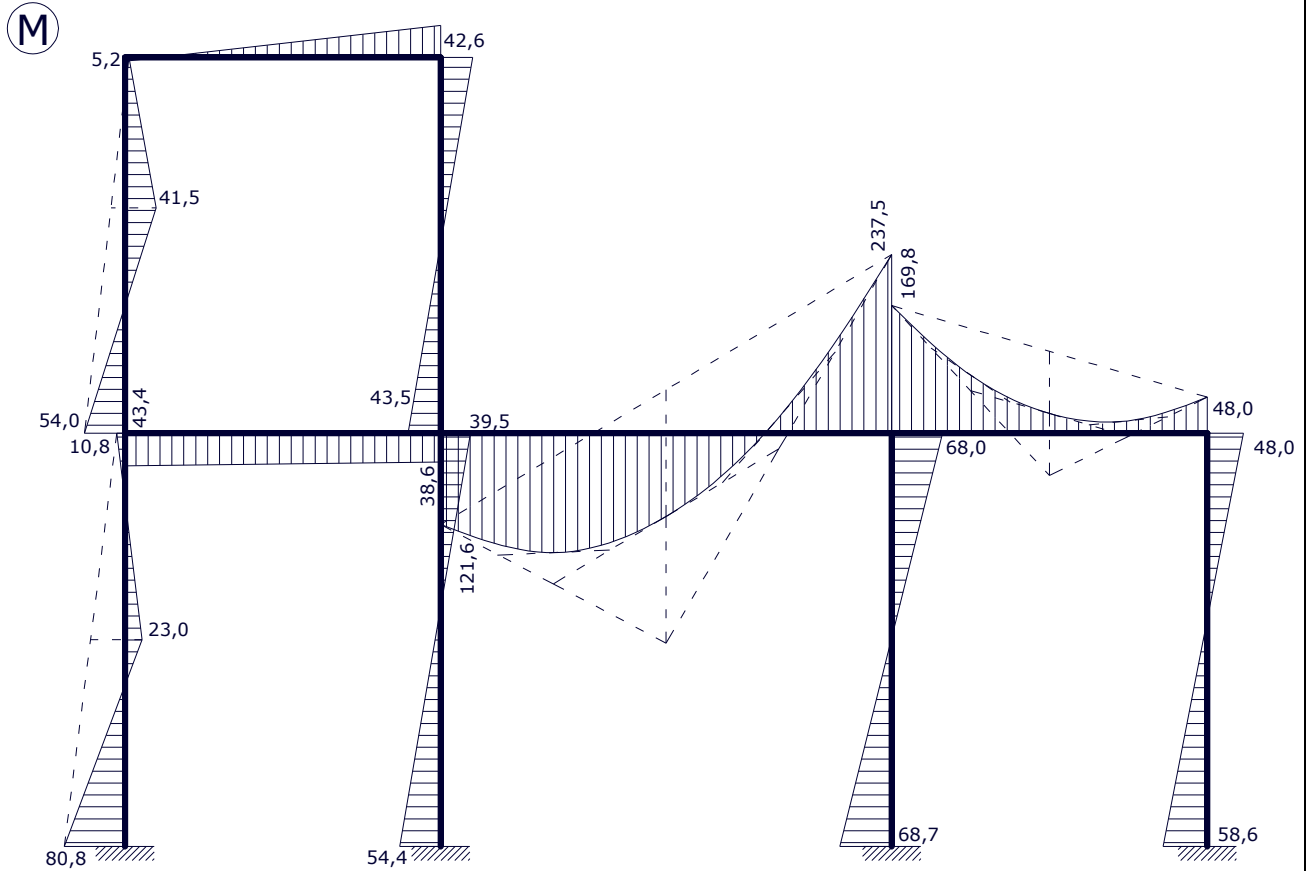
$$M_{78} = 201,7 - 1,01 \cdot 31,6 = 169,8 \text{ kNm}$$

$$M_{87} = 2,3 - 1,01 \cdot 49,8 = -48,0 \text{ kNm}$$

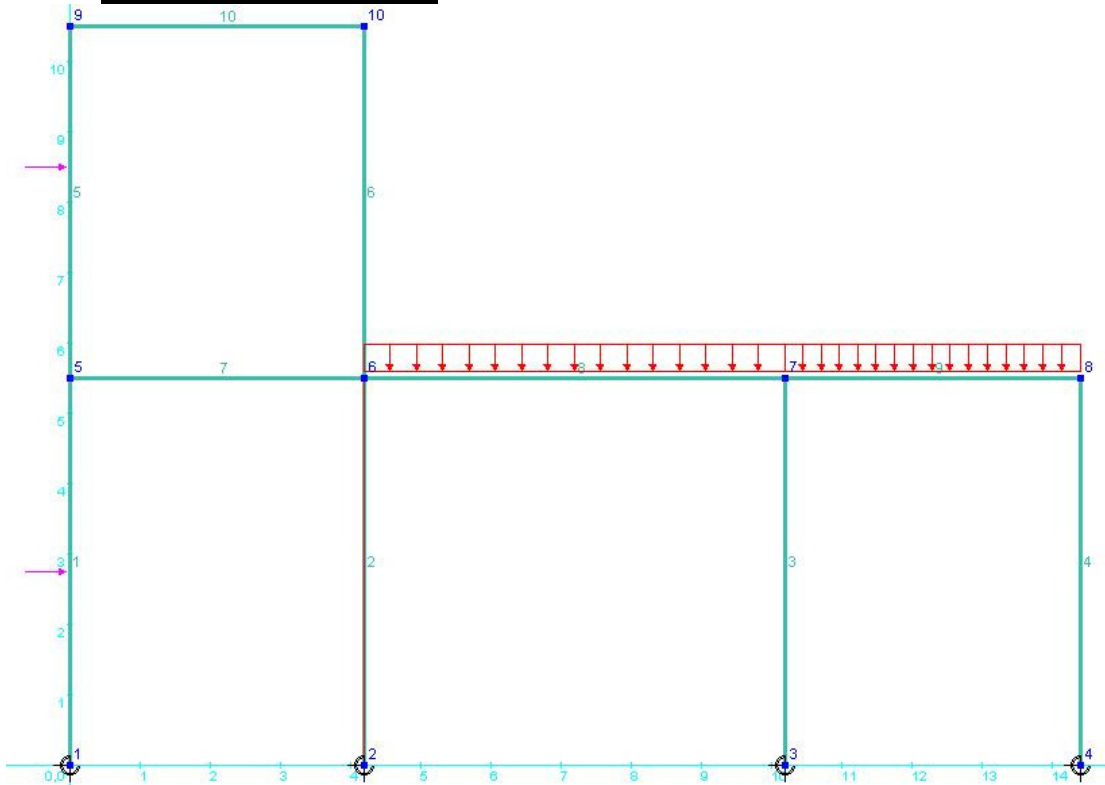
$$M_{9,10} = 65,8 - 1,01 \cdot 70,3 = -5,2 \text{ kNm}$$

$$M_{10,9} = 30,6 - 1,01 \cdot 72,5 = -42,6 \text{ kNm}$$

DIJAGRAMI



RJEŠENJE U DIM-u



Nodal displacements:

nd	u _i	v _i	phi _i
1:	0	0	0
2:	0	0	0
3:	0	0	0
4:	0	0	0
5:	0.00223916	2.75924e-10	-0.000324548
6:	0.00223916	-0.000990001	-0.000159187
7:	0.00223916	-5.12222e-09	0.000146206
8:	0.00223916	-9.40413e-10	-7.01765e-05
9:	0.00474139	4.52698e-10	-0.000213801
10:	0.00474139	-0.000990001	-0.000287

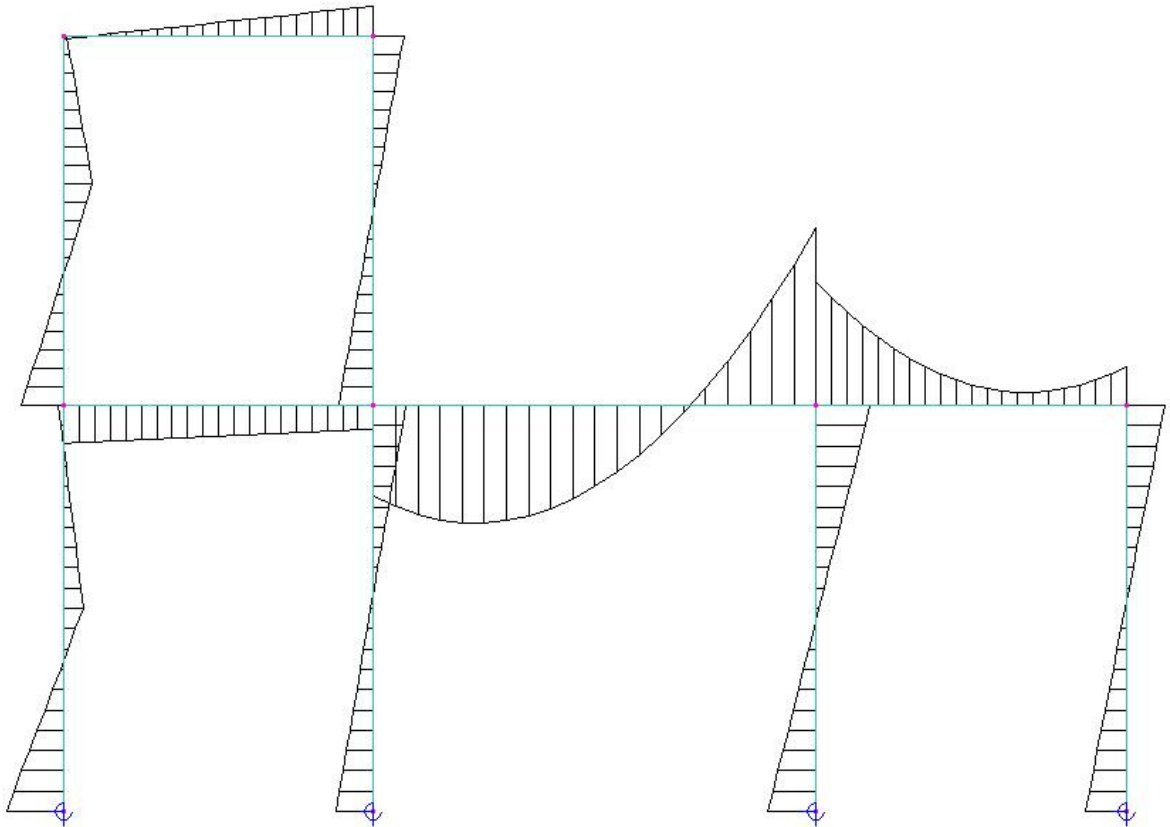
Element end forces:

el	N _{ij}	T _{ij}	M _{ij}	N _{ji}	T _{ji}	M _{ji}
1:	-15.0504	37.89	77.6536	15.0504	12.11	-6.7586
2:	66.8612	17.2428	51.2586	-66.8612	-17.2428	43.5765
3:	279.394	25.2815	65.9963	-279.394	-25.2815	73.052
4:	51.2953	19.5857	55.5541	-51.2953	-19.5857	52.1675
5:	-10.6064	32.3323	57.8912	10.6064	17.6677	3.77019
6:	10.6064	17.6677	47.5617	-10.6064	-17.6677	40.7769
7:	44.4423	-4.44398	-51.1326	-44.4423	4.44398	32.4679
8:	44.8673	51.8107	-123.606	-44.8673	173.189	-240.529
9:	19.5857	106.205	167.477	-19.5857	51.2953	-52.1675
10:	17.6677	-10.6064	-3.77019	-17.6677	10.6064	-40.7769

Reactions:

nd	R _x	R _y	M
1:	-37.89	-15.0504	77.6536
2:	-17.2428	66.8612	51.2586
3:	-25.2815	279.394	65.9963
4:	-19.5857	51.2953	55.5541

M DIJAGRAM



T DIJAGRAM

