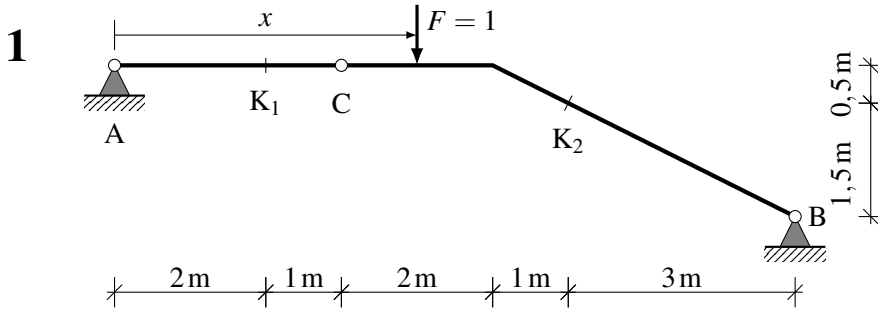
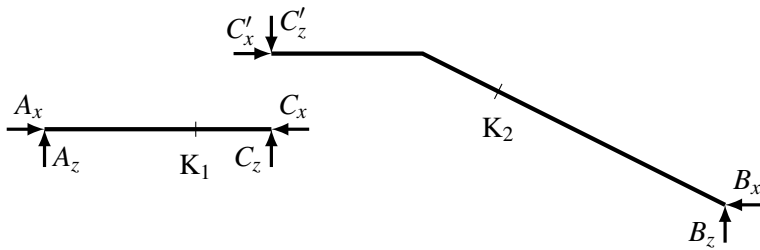


ELMOZDULÁSOK, HATÁSÁBRÁK

Gyakorlófeladatok (részletes eredmények)



Határozza meg a külső reakciókomponensek hatásábráját és az $\eta(V_{K1})$, $\eta(M_{K1})$, $\eta(N_{K2})$, $\eta(V_{K2})$ és $\eta(M_{K2})$ hatásábrákat!



$$\eta(A_z) = \begin{cases} \frac{1}{3}(3-x), & x < 3 \\ 0, & x > 3 \end{cases}$$

$$\eta(B_z) = 1 - \eta(A_z)$$

$$\eta(B_x) = \begin{cases} 3\eta(B_z), & x < 3 \\ 3\eta(B_z) - \frac{1}{2}(x-3), & x > 3 \end{cases}$$

$$\eta(V_{K1}) = \begin{cases} \eta(A_z) - 1, & x < 2 \\ \eta(A_z), & x > 2 \end{cases}$$

$$\eta(M_{K1}) = \begin{cases} 2\eta(A_z) - (2-x), & x < 2 \\ 2\eta(A_z), & x > 2 \end{cases}$$

$$\eta(N_{K2}) = \begin{cases} -0,4472\eta(B_z) - 0,8944\eta(B_x), & x < 6 \\ -0,4472\eta(B_z) - 0,8944\eta(B_x) + 0,4472, & x > 6 \end{cases}$$

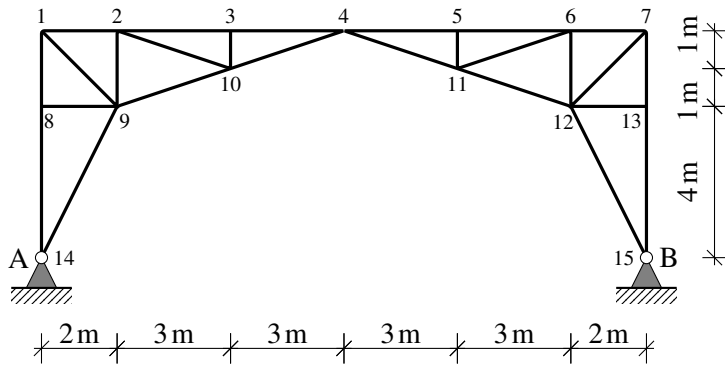
$$\eta(V_{K2}) = \begin{cases} -0,8944\eta(B_z) + 0,4472\eta(B_x), & x < 6 \\ -0,8944\eta(B_z) + 0,4472\eta(B_x) + 0,8944, & x > 6 \end{cases}$$

$$\eta(M_{K2}) = \begin{cases} 3\eta(B_z) - 1,5\eta(B_x), & x < 6 \\ 3\eta(B_z) - 1,5\eta(B_x) - (x-6), & x > 6 \end{cases}$$

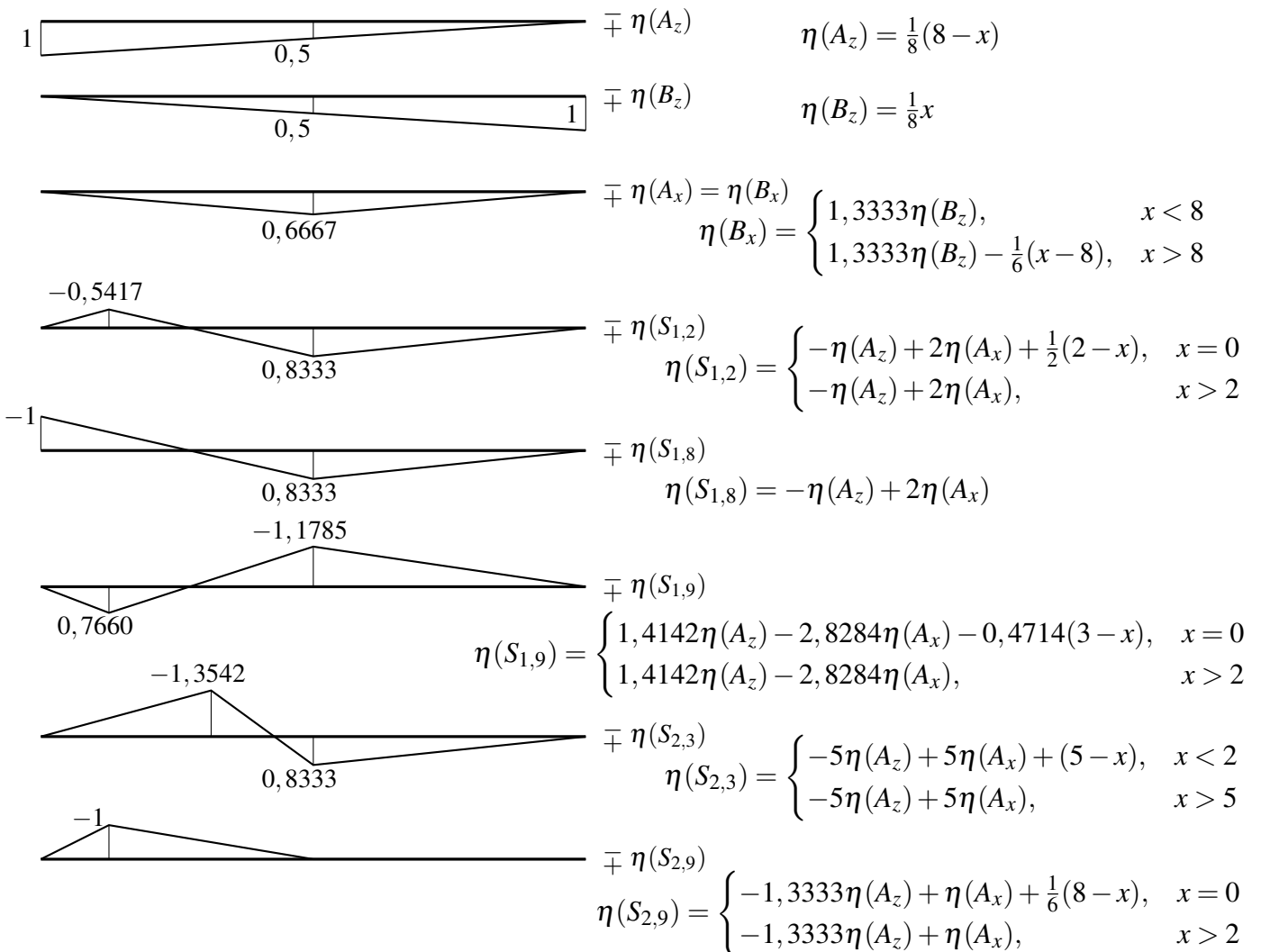
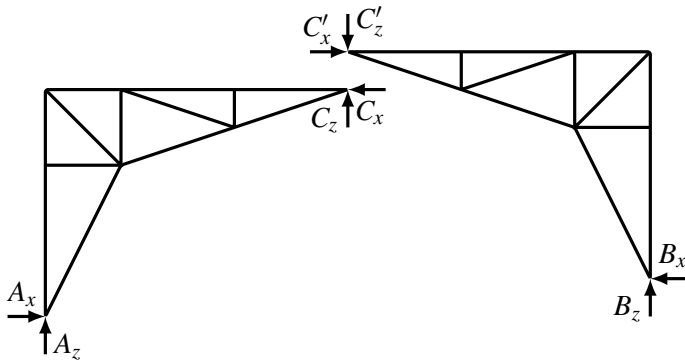
ELMOZDULÁSOK, HATÁSÁBRÁK

Gyakorlófeladatok (részletes eredmények)

2

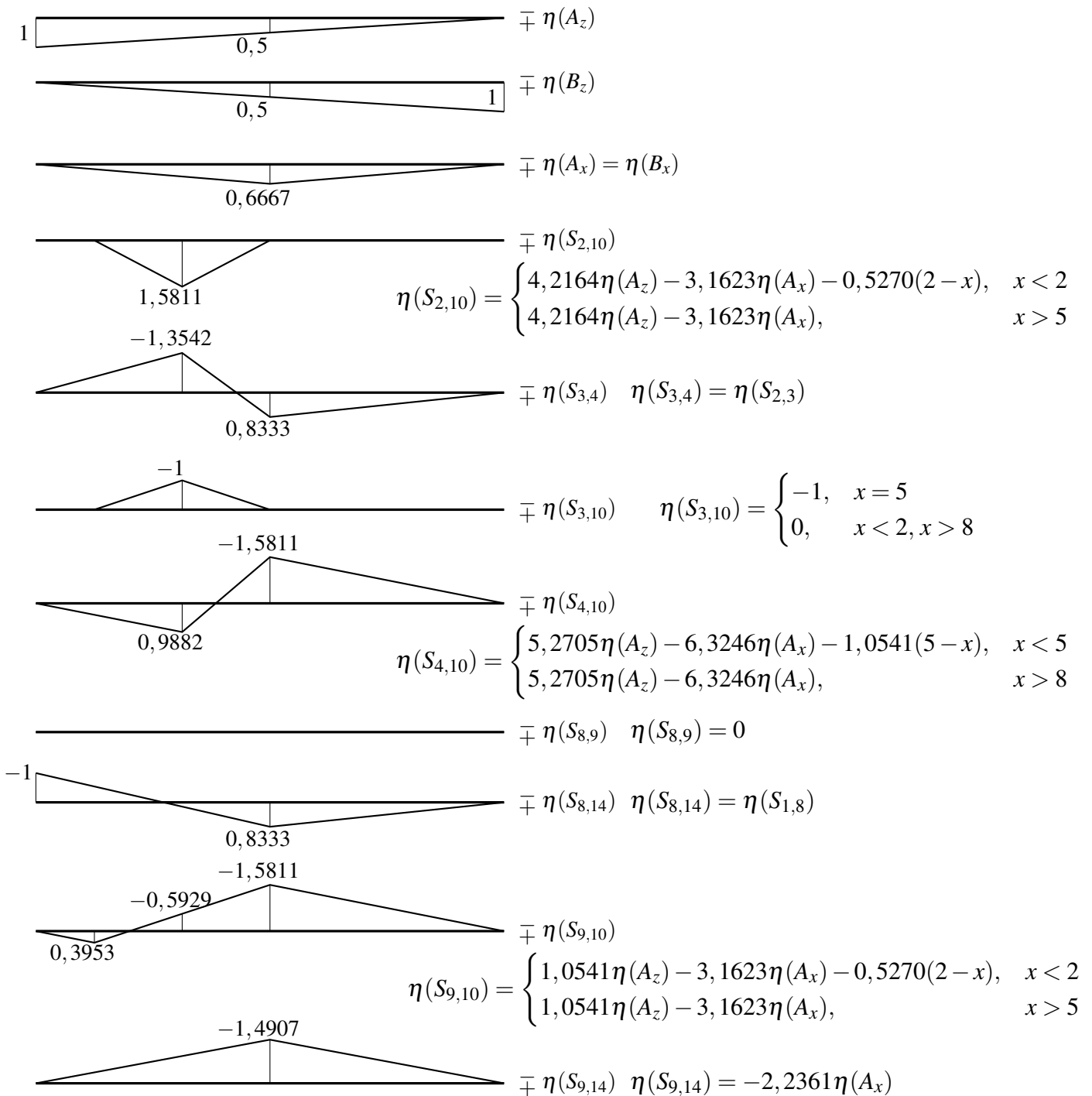
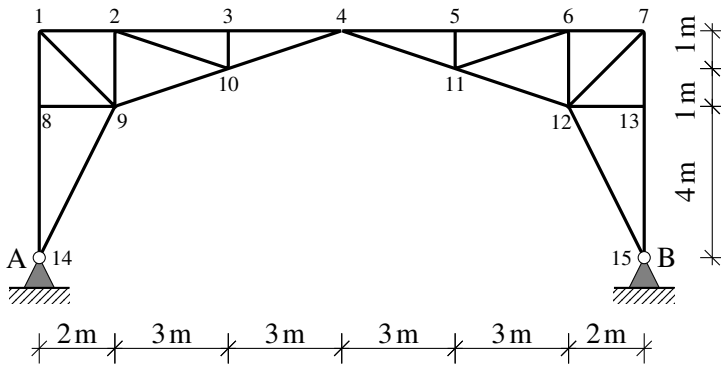


Adott az ábrán látható rácsos tartó. A teher az 1–7 vonalon helyezkedhet el. Határozza meg a külső reakciókomponensek hatásábráját és a tartó bal fele rúdjaiban ébredő erők hatásábráját!



ELMOZDULÁSOK, HATÁSÁBRÁK

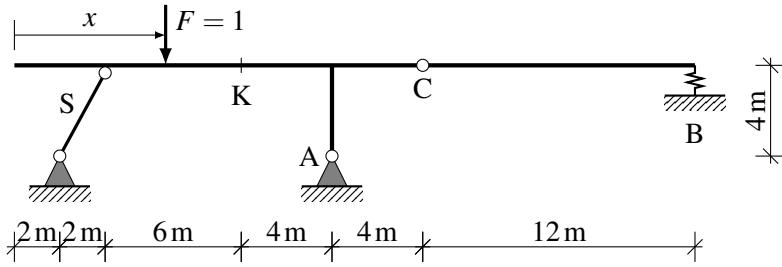
Gyakorlófeladatok (részletes eredmények)



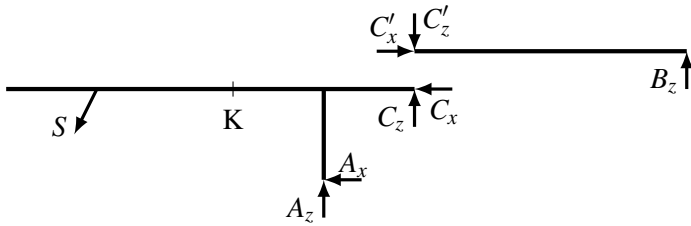
ELMOZDULÁSOK, HATÁSÁBRÁK

Gyakorlófeladatok (részletes eredmények)

3



Határozza meg a külső reakciókomponensek hatásábráját és a K keresztmetzet igénybevételi hatásábráit!



$$\eta(B) = \begin{cases} 0 & x < 18 \\ \frac{x-18}{12} & x > 18 \end{cases}$$

$$\eta(S) = -1,4907\eta(B) + 0,093169(x - 14)$$

$$\eta(A_x) = -0,4472\eta(S)$$

$$\eta(A_z) = -2,3333\eta(B) + 0,08333(x - 2)$$

$$\eta(N_K) = -\eta(A_x)$$

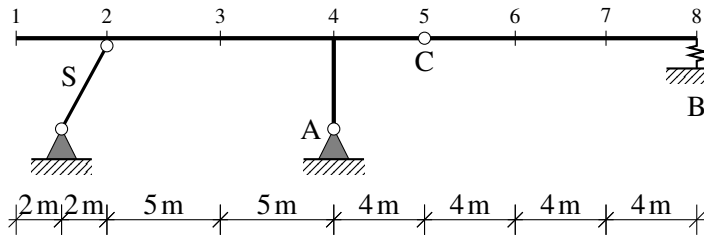
$$\eta(V_K) = \begin{cases} -0,8944\eta(S) - 1, & x < 10 \\ -0,8944\eta(S), & x > 10 \end{cases}$$

$$\eta(M_K) = \begin{cases} -5,3665\eta(S) - (10 - x), & x < 10 \\ -5,3665\eta(S), & x > 10 \end{cases}$$

ELMOZDULÁSOK, HATÁSÁBRÁK

Gyakorlófeladatok (részletes eredmények)

4



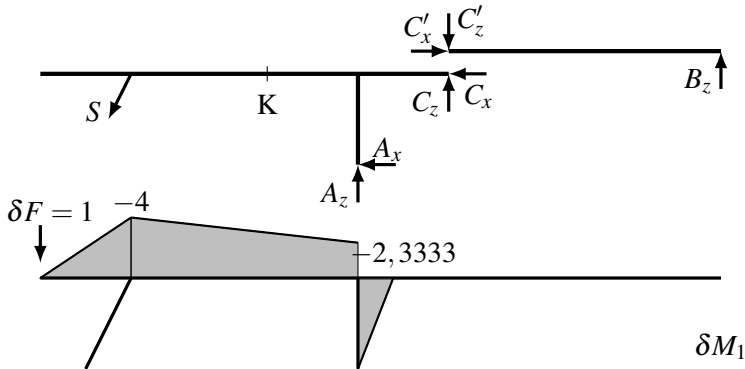
Határozza meg az $\eta(e_{3z})$, $\eta(\vartheta_C)$ és $\eta(e_{1x})$ hatásábrákat!

1–8: $EI = 4000 \text{ kNm}^2$, $EA = \infty$

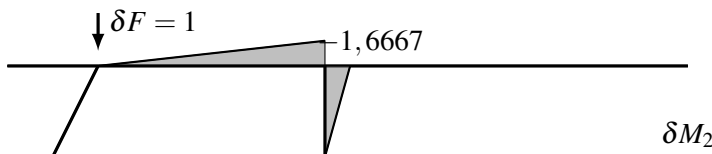
A–4: $EI = 2500 \text{ kNm}^2$, $EA = \infty$

S: $EA = 10000 \text{ kN}$

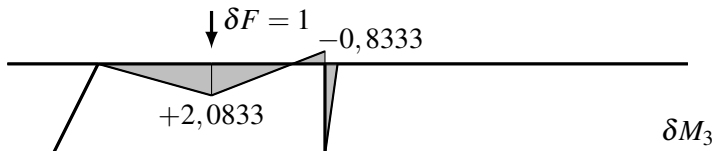
B: $\rho_B = 0,002 \text{ m/kN}$



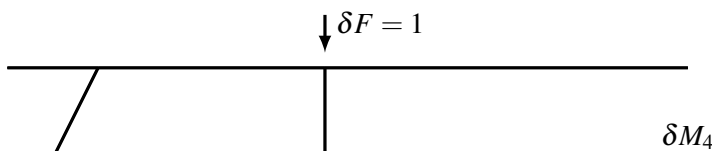
$$\begin{aligned} \delta B &= 0 & \delta A_x &= +0,5833 \\ \delta S &= -1,3044 & \delta A_z &= -0,1667 \end{aligned}$$



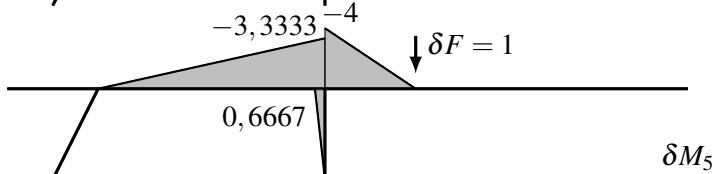
$$\begin{aligned} \delta B &= 0 & \delta A_x &= +0,4167 \\ \delta S &= -0,9317 & \delta A_z &= +0,1667 \end{aligned}$$



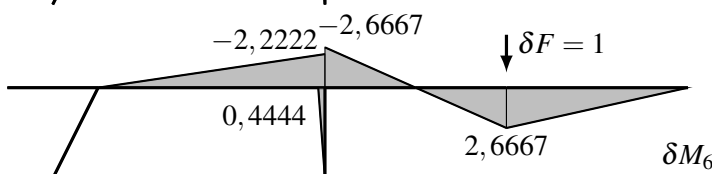
$$\begin{aligned} \delta B &= 0 & \delta A_x &= +0,2083 \\ \delta S &= -0,4658 & \delta A_z &= +0,5833 \end{aligned}$$



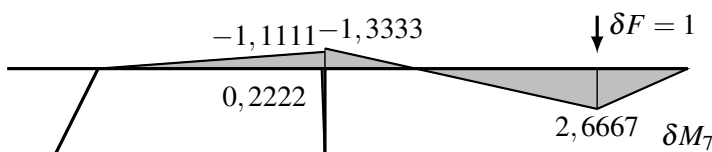
$$\begin{aligned} \delta B &= 0 & \delta A_x &= 0 \\ \delta S &= 0 & \delta A_z &= +1 \end{aligned}$$



$$\begin{aligned} \delta B &= 0 & \delta A_x &= -0,1667 \\ \delta S &= +0,3727 & \delta A_z &= +1,3333 \end{aligned}$$



$$\begin{aligned} \delta B &= +0,3333 & \delta A_x &= -0,1111 \\ \delta S &= +0,2485 & \delta A_z &= +0,8889 \end{aligned}$$



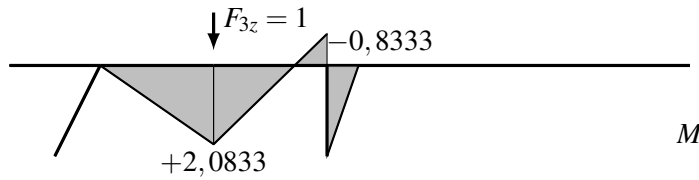
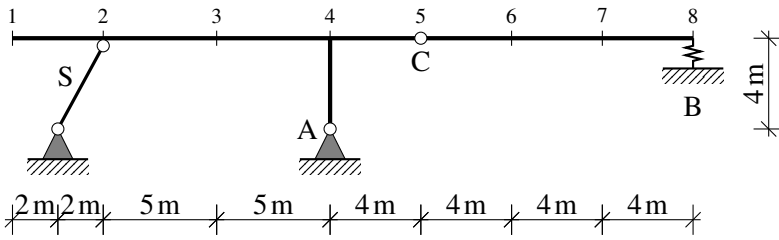
$$\begin{aligned} \delta B &= +0,6667 & \delta A_x &= -0,0556 \\ \delta S &= +0,1242 & \delta A_z &= +0,4444 \end{aligned}$$



$$\begin{aligned} \delta B &= +1 & \delta A_x &= 0 \\ \delta S &= 0 & \delta A_z &= 0 \end{aligned}$$

ELMOZDULÁSOK, HATÁSÁBRÁK

Gyakorlófeladatok (részletes eredmények)

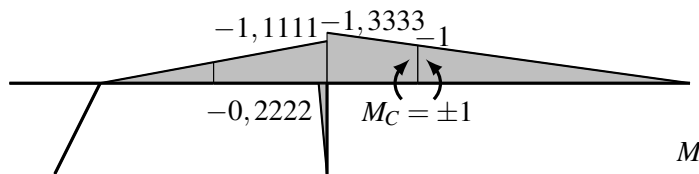
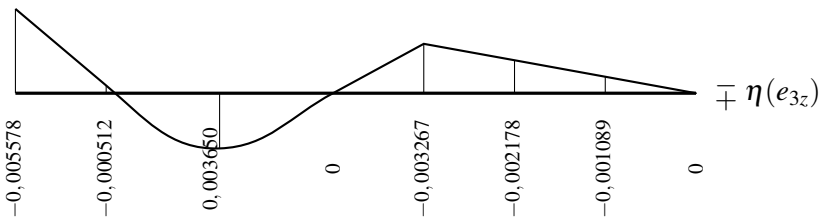


$$B = 0$$

$$S = -0,4658$$

$$A_x = +0,2083$$

$$A_z = +0,5833$$

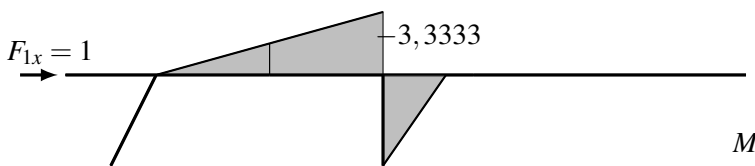
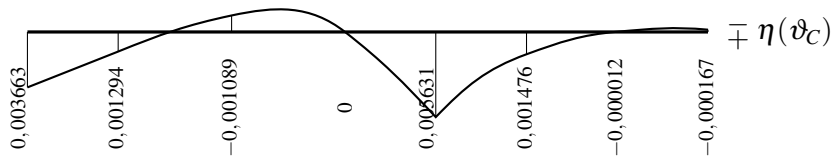


$$B = -0,08333$$

$$S = +0,12423$$

$$A_x = -0,05556$$

$$A_z = +0,19444$$

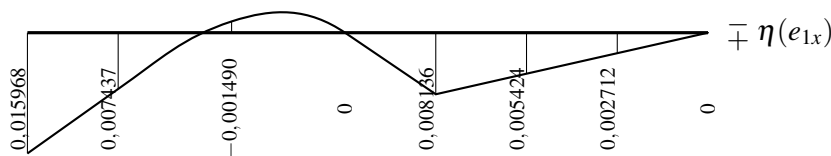


$$B = 0$$

$$S = +0,3727$$

$$A_x = +0,8333$$

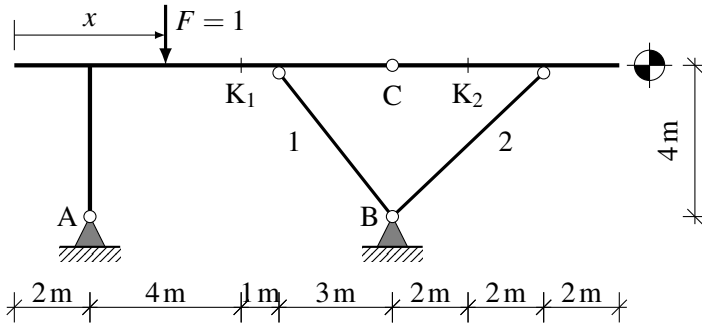
$$A_z = +0,3333$$



ELMOZDULÁSOK, HATÁSÁBRÁK

Gyakorlófeladatok (végeredmény)

5

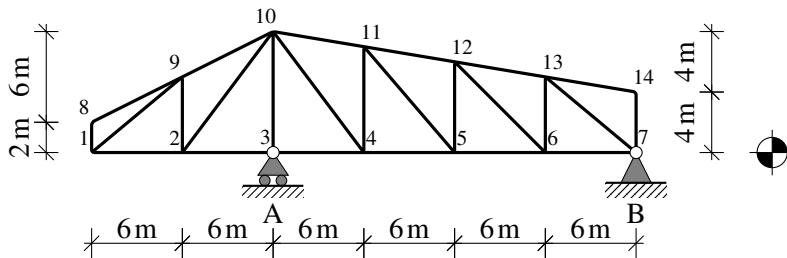


Határozza meg az alábbi hatásábrákat!

$\eta(S_1), \eta(S_2),$
 $\eta(N_{K1}), \eta(V_{K1}), \eta(M_{K1}),$
 $\eta(N_{K2}), \eta(V_{K2}), \eta(M_{K2})$

x [m]	0	2	6-	6+	10	12-	12+	14	16
$A_z \uparrow$	+1,2500	+1,0000	+0,5000	+0,5000	0	-0,2500	-0,2500	-0,5000	-0,7500
$A_x \rightarrow$	-0,1875	0	+0,3750	+0,3750	+0,7500	+0,0625	+0,0625	-0,6250	-1,3125
S_1	+0,3125	0	-0,6250	-0,6250	-1,2500	-0,9375	-0,9375	-0,6250	-0,3125
S_2	0	0	0	0	0	-0,7071	-0,7071	-1,4142	-2,1213
N_1	+0,1875	0	-0,3750	-0,3750	-0,7500	-0,0625	-0,0625	+0,6250	+1,3125
V_1	+0,2500	0	-0,5000	+0,5000	0,0000	-0,2500	-0,2500	-0,5000	-0,7500
M_1	-0,2500	0	+0,5000	+0,5000	+1,0000	-1,2500	-1,2500	+0,5000	+2,2500
N_2	0	0	0	0	0	+0,5000	+0,5000	+1,0000	+1,5000
V_2	0	0	0	0	0	-0,5000	+0,5000	0	-0,5000
M_2	0	0	0	0	0	+1,0000	+1,0000	0	-1,0000

6



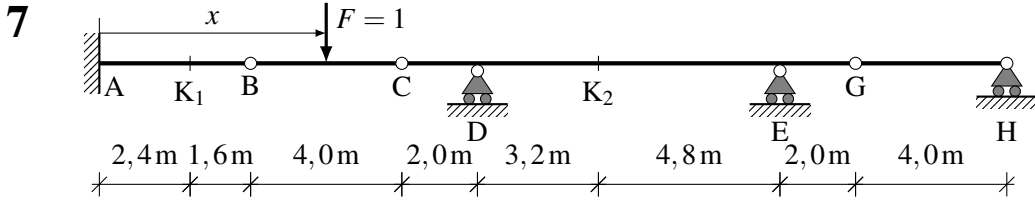
Határozza meg az alábbi hatásábrákat!

$\eta(S_{2,3}), \eta(S_{2,10}), \eta(S_{9,10}),$
 $\eta(S_{4,5}), \eta(S_{5,11}), \eta(S_{5,12}), \eta(S_{11,12})$

csp.	1	2	3	4	5	6	7
$A \uparrow$	+1,5000	+1,2500	+1,0000	+0,7500	+0,5000	+0,2500	0,0000
$B_z \uparrow$	-0,5000	-0,2500	0,0000	+0,2500	+0,5000	+0,7500	+1,0000
$S_{2,3}$	-1,5000	-0,7500	0,0000	0,0000	0,0000	0,0000	0,0000
$S_{2,10}$	+0,5000	+1,2500	0,0000	0,0000	0,0000	0,0000	0,0000
$S_{9,10}$	+1,3416	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
$S_{4,5}$	-1,2857	-0,6429	0,0000	+0,6429	+0,4286	+0,2143	0,0000
$S_{5,11}$	+0,4390	+0,2195	0,0000	-0,2195	+0,8781	+0,4390	0,0000
$S_{5,12}$	-0,3333	-0,1667	0,0000	+0,1667	+0,3333	-0,3333	0,0000
$S_{11,12}$	+1,0138	+0,5069	0,0000	-0,5069	-1,0138	-0,5069	0,0000

ELMOZDULÁSOK, HATÁSÁBRÁK

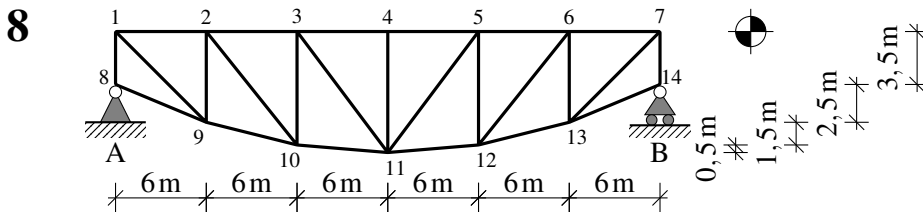
Gyakorlófeladatok (végeredmény)



Határozza meg az alábbi hatásábrákat!

$$\eta(V_{K1}), \eta(M_{K1}), \eta(V_{K2}), \eta(M_{K2})$$

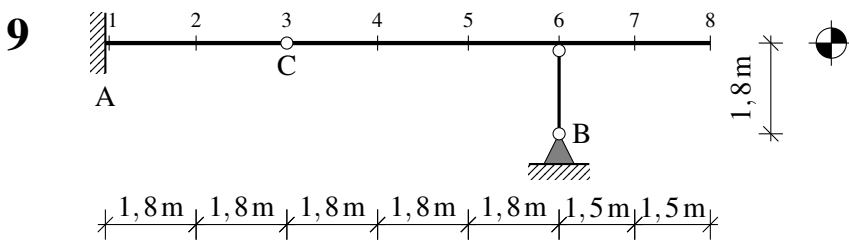
x [m]	0,0	2,4-	2,4+	4,0	8,0	10,0	13,2-	13,2+	18,0	20,0	24,0
V_1	0,0000	0,0000	+1,0000	+1,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
M_1	0,0000	0,0000	0,0000	-1,6000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
V_2	0,0000	0,0000	0,0000	0,0000	+0,2500	0,0000	-0,4000	+0,6000	0,0000	-0,2500	0,0000
M_3	0,0000	0,0000	0,0000	0,0000	-1,2000	0,0000	+1,9200	+1,9200	0,0000	-0,8000	0,0000



Határozza meg az alábbi hatásábrákat!

$$\eta(S_{2,10}), \eta(S_{3,4}), \eta(S_{4,11}), \eta(S_{5,11}), \eta(S_{7,14}), \eta(S_{12,13})$$

csf.	1	2	3	4	5	6	7
$A_z \uparrow$	+1,0000	+0,8333	+0,6667	+0,5000	+0,3333	+0,1667	0,0000
$B \uparrow$	0,0000	+0,1667	+0,3333	+0,5000	+0,6667	+0,8333	+1,0000
$S_{2,10}$	0,0000	-0,4802	+0,6403	+0,4802	+0,3202	+0,1601	0,0000
$S_{3,4}$	0,0000	-0,3750	-0,7500	-1,1250	-0,7500	-0,3750	0,0000
$S_{4,11}$	0,0000	0,0000	0,0000	-1,0000	0,0000	0,0000	0,0000
$S_{5,11}$	0,0000	+0,1806	+0,3611	+0,5417	-0,5278	-0,2639	0,0000
$S_{7,14}$	0,0000	-0,1667	-0,3333	-0,5000	-0,6667	-0,8333	-1,0000
$S_{12,13}$	0,0000	+0,1718	+0,3436	+0,5154	+0,6872	+0,8590	0,0000



Határozza meg az alábbi hatásábrákat!

$$\eta(e_{3z}), \eta(\vartheta_C), \eta(e_{8z}), \eta(\varphi_8)$$

$$EI_{1-3} = 2000 \text{ kNm}^2$$

$$EI_{3-8} = 1600 \text{ kNm}^2$$

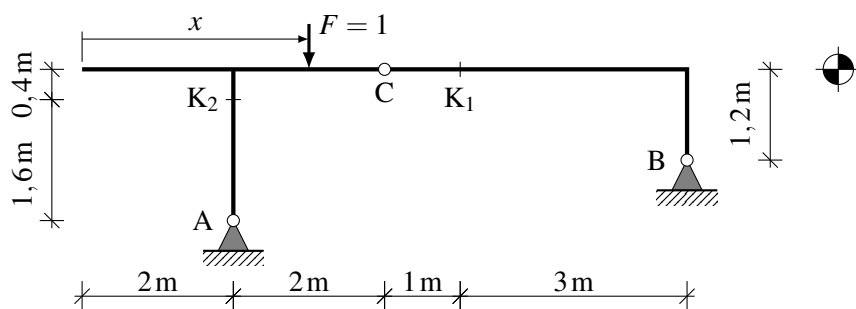
$$EA_{B-6} = 12000 \text{ kN}$$

km.	1	2	3	4	5	6	7	8	
e_{3z}	0,0000	+2,4300	+7,7760	+5,1840	+2,5920	0,0000	-2,1600	-4,3200	$\times 10^{-3} \text{ m/kN}$
ϑ_C	0,0000	+1,2600	+4,6800	+1,9857	+0,6415	-0,0278	-0,4917	-0,9557	$\times 10^{-3} \text{ rad/kN}$
e_{8z}	0,0000	-1,3500	-4,3200	-5,5022	-4,6594	+0,2333	+8,3185	+18,5130	$\times 10^{-3} \text{ m/kN}$
φ_8	0,0000	+0,4500	+1,4400	+1,8507	+1,5865	-0,0278	-2,8261	-7,0307	$\times 10^{-3} \text{ rad/kN}$

ELMOZDULÁSOK, HATÁSÁBRÁK

Gyakorlófeladatok (végeredmény)

10



Határozza meg az alábbi hatásábrákat!

$\eta(A_z)$, $\eta(B_z)$, $\eta(A_x)$,
 $\eta(N_{K1})$, $\eta(V_{K1})$, $\eta(M_{K1})$,
 $\eta(N_{K2})$, $\eta(V_{K2})$, $\eta(M_{K2})$

x [m]	0	2	4	5-	5+	8
$A_z \uparrow$	+1,2308	+1,0000	+0,7692	+0,5769	+0,5769	0,0000
$B_z \uparrow$	-0,2308	0,0000	+0,2308	+0,4231	+0,4231	+1,0000
$A_x \rightarrow$	-0,7692	0,0000	+0,7692	+0,5769	+0,5769	0,0000
N_1	+0,7692	0,0000	-0,7692	-0,5769	-0,5769	0,0000
V_1	+0,2308	0,0000	-0,2308	-0,4231	+0,5769	0,0000
M_1	+0,2308	0,0000	-0,2308	+0,5770	+0,5770	0,0000
N_2	-1,2308	-1,0000	-0,7692	-0,5769	-0,5769	0,0000
V_2	+0,7692	0,0000	-0,7692	-0,5769	-0,5769	0,0000
M_2	+1,2308	0,0000	-1,2308	-0,9231	-0,9231	0,0000