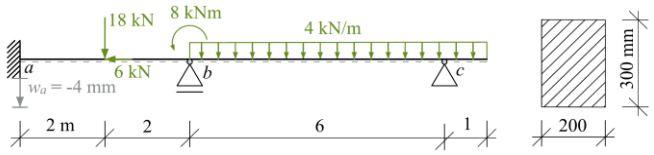
Na zadané prutové konstrukci pomocí obecné deformační metody vykreslete průběhy vnitřních sil.



1)

Výpočtový model, n_p

$E = 24$ GPa

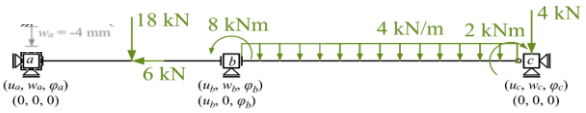
$I = \frac{1}{12} \cdot 0{,}2 \cdot 0{,}3^3 \rightarrow$

$I = 4{,}5 \cdot 10^{-4}$ m^4

$EI = 10{,}8 \cdot 10^6$ Nm^2

$EA = 1\,440 \cdot 10^6$ N

$n_p = 2$



jednotky: [m, rad, kN, kPa]

{r}

u_b
phi_b

{S}

0	***X_b***
8	***M_b***

Analýza prutů -- PRIMÁRNÍ ÚČINKY

Prut a-b

gamma	0	**[rad]**	0 [deg]
sin gamma	0.00		
cos gamma	1.00		
b	0.20	[m]	
h	0.30	[m]	
delka	4	[m]	
E	2.40E+07	[kPa]	
A	0.06	[m2]	
I	4.50E-04	[m4]	
EA	1.44E+06	[kPa*m2]	
EI	1.08E+04	[kPa*m4]	

[T_ab]

1.00	0.00	0	0	0	0
0.00	1.00	0	0	0	0
0	0	1	0	0	0
0	0	0	1.00	0.00	0
0	0	0	0.00	1.00	0
0	0	0	0	0	1

[T_ab]^T

1.00	0.00	0	0	0	0
0.00	1.00	0	0	0	0
0	0	1	0	0	0
0	0	0	1.00	0.00	0
0	0	0	0.00	1.00	0
0	0	0	0	0	1

a) vetknutí-vetknutí

[k_ab]*

u_ab	*w_ab*	*phi_ab*	***u_ba***	*w_ba*	***phi_ba***	
3.600E+05	0.000E+00	0.000E+00	-3.600E+05	0.000E+00	0.000E+00	*X_ab*
0.000E+00	2.025E+03	-4.050E+03	0.000E+00	-2.025E+03	-4.050E+03	*Z_ab*
0.000E+00	-4.050E+03	1.080E+04	0.000E+00	4.050E+03	5.400E+03	*M_ab*
-3.600E+05	0.000E+00	0.000E+00	3.600E+05	0.000E+00	0.000E+00	***X_ba***
0.000E+00	-2.025E+03	4.050E+03	0.000E+00	2.025E+03	4.050E+03	*Z_ba*
0.000E+00	-4.050E+03	5.400E+03	0.000E+00	4.050E+03	1.080E+04	***M_ba***

[k_ab]

u_ab	*w_ab*	*phi_ab*	***u_ba***	*w_ba*	***phi_ba***	
3.60E+05	0.00E+00	0.00E+00	-3.60E+05	0.00E+00	0.00E+00	*X_ab*
0.00E+00	2.03E+03	-4.05E+03	0.00E+00	-2.03E+03	-4.05E+03	*Z_ab*
0.00E+00	-4.05E+03	1.08E+04	0.00E+00	4.05E+03	5.40E+03	*M_ab*
-3.60E+05	0.00E+00	0.00E+00	**3.60E+05**	0.00E+00	**0.00E+00**	***X_ba***
0.00E+00	-2.03E+03	4.05E+03	0.00E+00	2.03E+03	4.05E+03	*Z_ba*
0.00E+00	-4.05E+03	5.40E+03	**0.00E+00**	4.05E+03	**1.08E+04**	***M_ba***

Fx	n	M	t0
Fz	q		t1/h
a		a	alpha_t
b		b	EA
l	l	l	EI
-6	0	0	0
18	0		0
2		0	0
2		0	1.44E+06
4	4	4	1.08E+04

{Rp_ab}*

3.00	0.00	0.00	0.00	**3.00**	X_ab
-9.00	0.00	0.00	0.00	**-9.00**	Z_ab
9.00	0.00	0.00	0.00	**9.00**	M_ab
3.00	0.00	0.00	0.00	**3.00**	X_ba
-9.00	0.00	0.00	0.00	**-9.00**	Z_ba
-9.00	0.00	0.00	0.00	**-9.00**	M_ba

{Rp_ab}

3.00	*X_ab*
-9.00	*Z_ab*
9.00	*M_ab*
3.00	***X_ba***
-9.00	*Z_ba*
-9.00	***M_ba***

{r_pop}

0	*u_ab*
-4.00E-03	*w_ab*
0	*phi_ab*
0	***u_ba***
0	*w_ba*
0	***phi_ba***

{Rpop_ab}

0.00	*X_ab*
-8.10	*Z_ab*
16.20	*M_ab*
0.00	***X_ba***
8.10	*Z_ba*
16.20	***M_ba***

Prut b-c

gamma	0	**[rad]**	0 [deg]
sin gamma	0.00		
cos gamma	1.00		
b	0.20	[m]	
h	0.30	[m]	
delka	6	[m]	
E	2.40E+07	[kPa]	
A	0.06	[m2]	
I	4.50E-04	[m4]	
EA	1.44E+06	[kPa*m2]	
EI	1.08E+04	[kPa*m4]	

[T_bc]

1.00	0.00	0	0	0	0
0.00	1.00	0	0	0	0
0	0	1	0	0	0
0	0	0	1.00	0.00	0
0	0	0	0.00	1.00	0
0	0	0	0	0	1

[T_bc]^T

1.00	0.00	0	0	0	0
0.00	1.00	0	0	0	0
0	0	1	0	0	0
0	0	0	1.00	0.00	0
0	0	0	0.00	1.00	0
0	0	0	0	0	1

b) vetknutí-kloub

[k_bc]*

u_bc	*w_bc*	***phi_bc***	*u_cb*	*w_cb*	*phi_cb*	
2.400E+05	0.000E+00	0.000E+00	-2.400E+05	0.000E+00	0.000E+00	***X_bc***
0.000E+00	1.500E+02	-9.000E+02	0.000E+00	-1.500E+02	0.000E+00	*Z_bc*
0.000E+00	-9.000E+02	5.400E+03	0.000E+00	9.000E+02	0.000E+00	***M_bc***
-2.400E+05	0.000E+00	0.000E+00	2.400E+05	0.000E+00	0.000E+00	*X_cb*
0.000E+00	-1.500E+02	9.000E+02	0.000E+00	1.500E+02	0.000E+00	*Z_cb*
0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	*M_cb*

[k_bc]

u_bc	*w_bc*	***phi_bc***	*u_cb*	*w_cb*	*phi_cb*	
2.40E+05	0.00E+00	**0.00E+00**	-2.40E+05	0.00E+00	0.00E+00	***X_bc***
0.00E+00	1.50E+02	-9.00E+02	0.00E+00	-1.50E+02	0.00E+00	*Z_bc*
0.00E+00	-9.00E+02	**5.40E+03**	0.00E+00	9.00E+02	0.00E+00	***M_bc***
-2.40E+05	0.00E+00	0.00E+00	2.40E+05	0.00E+00	0.00E+00	*X_cb*
0.00E+00	-1.50E+02	9.00E+02	0.00E+00	1.50E+02	0.00E+00	*Z_cb*
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	*M_cb*

Fx	n	M	t0
Fz	q		t1/h
a		a	alpha_t
b		b	EA
l	l	l	EI
0	0	-2	0
0	4		0
0		6	0
0		0	1.44E+06
6	6	6	1.08E+04

{Rp_bc}*

0.00	0.00	0.00	0.00	**0.00**	X_ab
0.00	-15.00	0.50	0.00	**-14.50**	Z_ab
0.00	18.00	-1.00	0.00	**17.00**	M_ab
0.00	0.00	0.00	0.00	**0.00**	X_ba
0.00	-9.00	-0.50	0.00	**-9.50**	Z_ba
0.00	0.00	0.00	0.00	**0.00**	M_ba

{Rp_bc}

0.00	***X_bc***
-14.50	*Z_bc*
17.00	***M_bc***
0.00	*X_cb*
-9.50	*Z_cb*
0.00	*M_cb*

{r_pop}

0	***u_bc***
0	*w_bc*
0	***phi_bc***
0	*u_cb*
0	*w_cb*
0	*phi_cb*

{Rpop_bc}

0.00	***X_bc***
0.00	*Z_bc*
0.00	***M_bc***
0.00	*X_cb*
0.00	*Z_cb*
0.00	*M_cb*

Soustava rovnic

	u_b	*phi_b*	
[K]	6.00E+05	0.00E+00	***X_b***
	0.00E+00	1.62E+04	***M_b***

{Rp}	3.00	***X_b***
	24.20	***M_b***

{F}	-3.00	***X_b***
	-16.2	***M_b***

{F}={S}-{R}

{r}	-5.00E-06	***u_b***	[m]
	-1.00E-03	***phi_b***	[rad]

[K]*{r}={F} --> {r}=[K]^(-1) * {F}

Analýza prutů -- SEKUNDÁRNÍ ÚČINKY

Prut a-b

{r_ab}	0	*u_ab*
	-4.00E-03	*w_ab*
	0	*phi_ab*
	-5.00E-06	***u_ba***
	0	*w_ba*
	-1.00E-03	***phi_ba***

{Rs_ab}	**1.80**	*X_ab*
	-4.05	*Z_ab*
	10.80	*M_ab*
	-1.80	***X_ba***
	4.05	*Z_ba*
	5.40	***M_ba***

{Rs_ab}*	**1.80**	*X_ab*
	-4.05	*Z_ab*
	10.80	*M_ab*
	-1.80	***X_ba***
	4.05	*Z_ba*
	5.40	***M_ba***

CELKOVÉ ÚČINKY

{R_ab}	**4.80**	*X_ab*
	-13.05	*Z_ab*
	19.80	*M_ab*
	1.20	***X_ba***
	-4.95	*Z_ba*
	-3.60	***M_ba***

{R_ab}*	**4.80**	*X_ab*
	-13.05	*Z_ab*
	19.80	*M_ab*
	1.20	***X_ba***
	-4.95	*Z_ba*
	-3.60	***M_ba***

Prut b-c

{r_bc}	-5.00E-06	***u_bc***
	0	*w_bc*
	-1.00E-03	***phi_bc***
	0	*u_cb*
	0	*w_cb*
	0	*phi_cb*

{Rs_bc}	**-1.20**	***X_bc***
	0.90	*Z_bc*
	-5.40	***M_bc***
	1.20	*X_cb*
	-0.90	*Z_cb*
	0.00	*M_cb*

{Rs_bc}*	**-1.20**	***X_bc***
	0.90	*Z_bc*
	-5.40	***M_bc***
	1.20	*X_cb*
	-0.90	*Z_cb*
	0.00	*M_cb*

CELKOVÉ ÚČINKY

{R_bc}	**-1.20**	***X_bc***
	-13.60	*Z_bc*
	11.60	***M_bc***
	1.20	*X_cb*
	-10.40	*Z_cb*
	0.00	*M_cb*

{R_bc}*	**-1.20**	***X_bc***
	-13.60	*Z_bc*
	11.60	***M_bc***
	1.20	*X_cb*
	-10.40	*Z_cb*
	0.00	*M_cb*