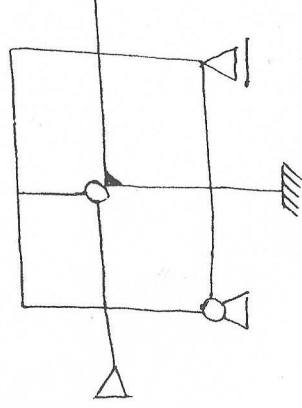
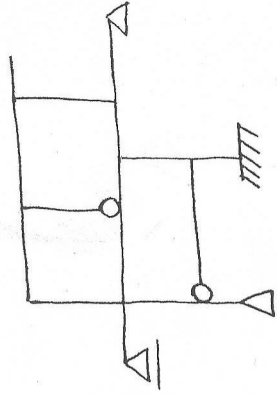


Určete: SSN, SPN, SPNzm.

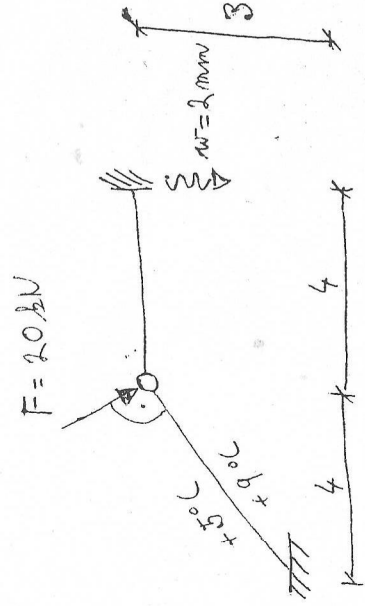
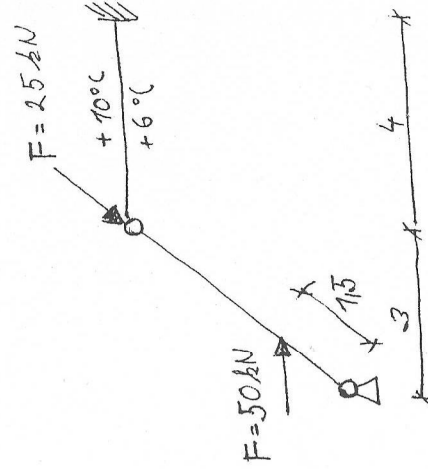


Vyřešte deformační stav konstrukce.



$$E = 3 \cdot 10^7 \text{ bPa}$$

$$\alpha = 1 \cdot 10^{-5} \text{ } ^\circ\text{C}^{-1}$$

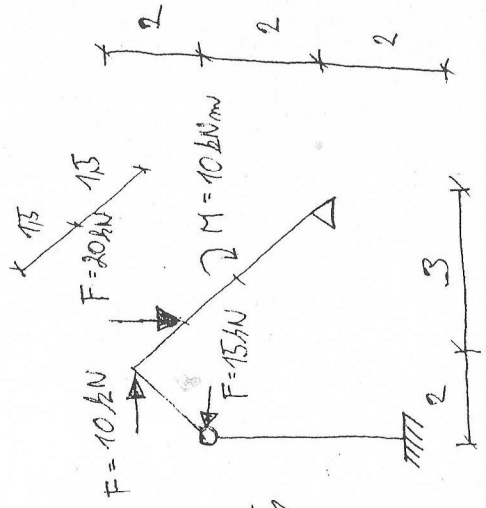
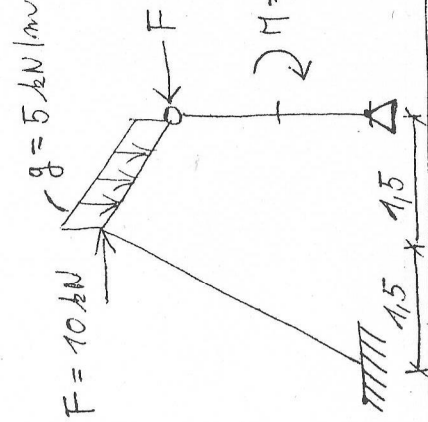


Určete numerický tvar vektoru pravé strany.



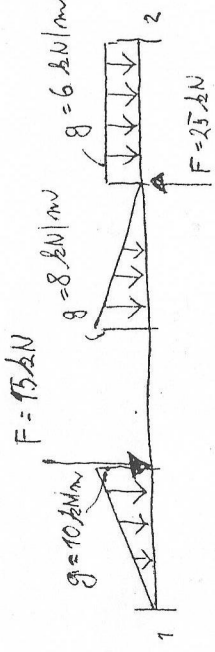
$$E = 3 \cdot 10^7 \text{ bPa}$$

$$\alpha = 1 \cdot 10^{-5} \text{ } ^\circ\text{C}^{-1}$$

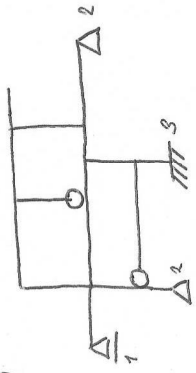


Vykreslete průběh vnitřních sil.

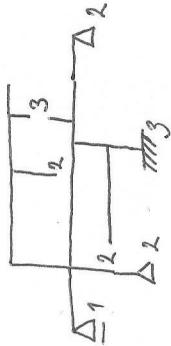
$$\{R_{12}^*\} = \begin{Bmatrix} x_1^* \\ z_1^* \\ M_1^* \\ x_2^* \\ z_2^* \\ M_2^* \end{Bmatrix} = \begin{Bmatrix} 0 \\ -28 \\ 24 \\ 0 \\ -7 \\ 15 \end{Bmatrix}$$



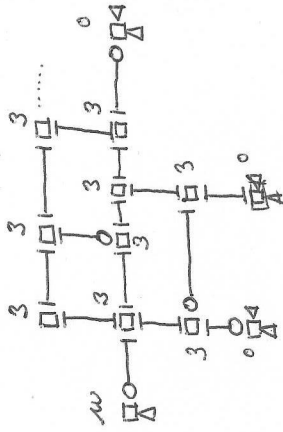
1)



$$SSN = 8 + 3 \cdot 3 - 2 - 3 = 12 \times SN$$

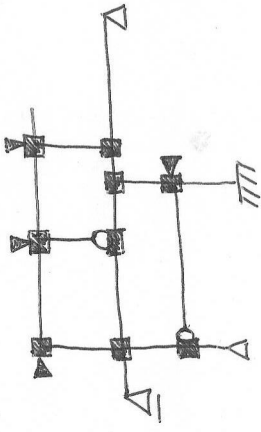


$$SSN = 8 + 7 - 1 \cdot 3 = 12 \times SN$$

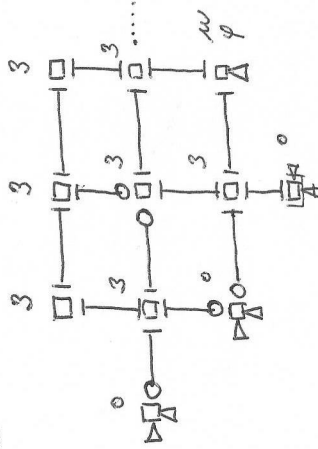


$$SPN = 3 \cdot 9 + 1 = 28$$

$$m_f = 28$$

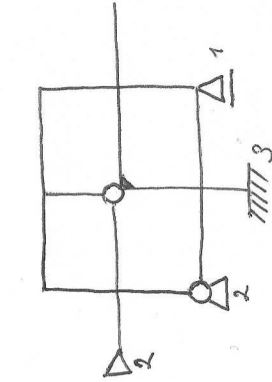


$$m_f = 13$$

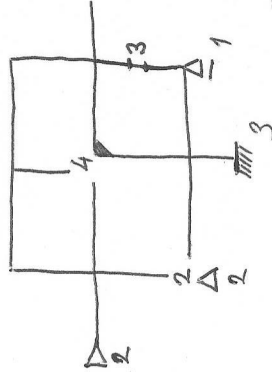


$$SPN = 3 \cdot 7 + 2 = 23$$

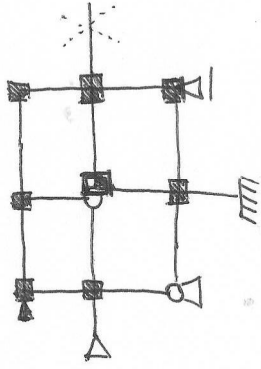
$$m_f = 23$$



$$SSN = 8 + 4 \cdot 3 - 3 - 3 = 14 \times SN$$

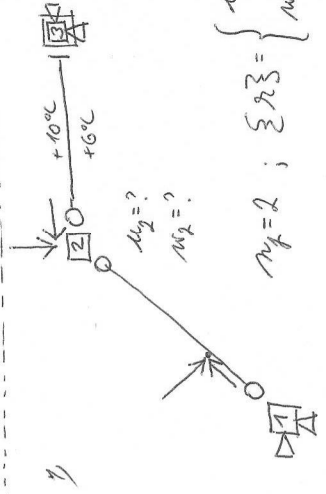
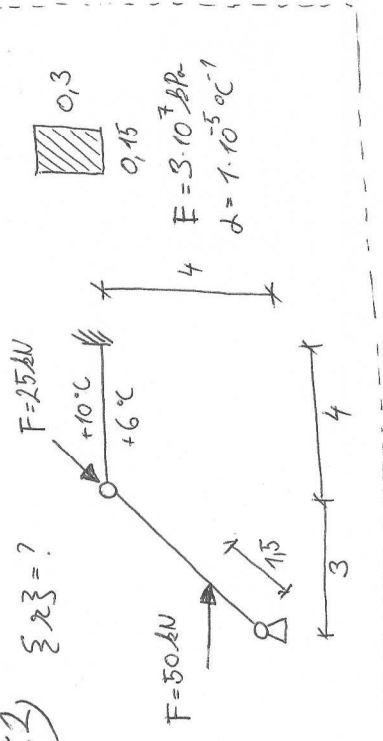


$$SSN = 8 + 9 - 1 \cdot 3 = 14 \times SN$$



$$m_f = 9$$

Pr. 2



$$n_1 = 2; \{r\} = \begin{Bmatrix} u_2 \\ w_2 \end{Bmatrix}; \{s\} = \begin{Bmatrix} x_2 \\ z_2 \end{Bmatrix}$$

2) PRUT 12

$$[K_{12}] = \begin{bmatrix} \mu_1 & \mu_2 & \mu_3 & \mu_4 & \mu_5 & \mu_6 \\ \mu_7 & \mu_8 & \mu_9 & \mu_{10} & \mu_{11} & \mu_{12} \\ \mu_{13} & \mu_{14} & \mu_{15} & \mu_{16} & \mu_{17} & \mu_{18} \\ \mu_{19} & \mu_{20} & \mu_{21} & \mu_{22} & \mu_{23} & \mu_{24} \\ \mu_{25} & \mu_{26} & \mu_{27} & \mu_{28} & \mu_{29} & \mu_{30} \\ \mu_{31} & \mu_{32} & \mu_{33} & \mu_{34} & \mu_{35} & \mu_{36} \end{bmatrix}$$

$$\{R_{12}^*\} = \begin{Bmatrix} x_1^* \\ z_1^* \\ \mu_1^* \\ x_2^* \\ z_2^* \\ \mu_2^* \end{Bmatrix} \rightarrow \{\bar{R}_{12}\} = \begin{Bmatrix} x_1 \\ z_1 \\ \mu_1 \\ x_2 \\ z_2 \\ \mu_2 \end{Bmatrix}$$

PRUT 23

$$[K_{23}] = \begin{bmatrix} \mu_1 & \mu_2 & \mu_3 & \mu_4 & \mu_5 & \mu_6 \\ \mu_7 & \mu_8 & \mu_9 & \mu_{10} & \mu_{11} & \mu_{12} \\ \mu_{13} & \mu_{14} & \mu_{15} & \mu_{16} & \mu_{17} & \mu_{18} \\ \mu_{19} & \mu_{20} & \mu_{21} & \mu_{22} & \mu_{23} & \mu_{24} \\ \mu_{25} & \mu_{26} & \mu_{27} & \mu_{28} & \mu_{29} & \mu_{30} \\ \mu_{31} & \mu_{32} & \mu_{33} & \mu_{34} & \mu_{35} & \mu_{36} \end{bmatrix}$$

$$\{\bar{R}_{12}\} = \begin{Bmatrix} x_2 \\ z_2 \\ \mu_2 \\ x_3 \\ z_3 \\ \mu_3 \end{Bmatrix}$$

3)

$$[K] = \begin{bmatrix} + & + \\ + & + \end{bmatrix} \begin{matrix} \mu_2 \\ w_2 \end{matrix} \quad \{\bar{R}\} = \begin{Bmatrix} x_2 \\ z_2 \end{Bmatrix} \quad \{F\} = \begin{Bmatrix} x_2 \\ z_2 \end{Bmatrix}$$

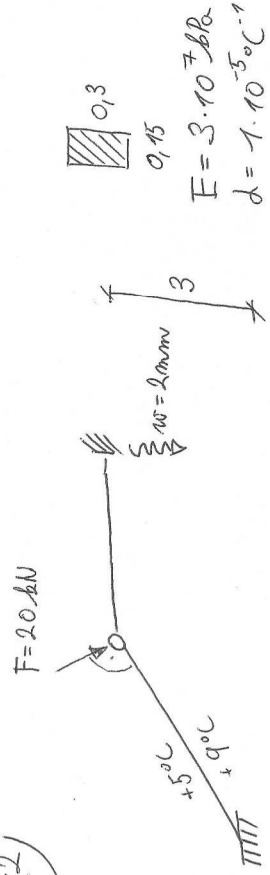
$$[K] \cdot \{r\} = \{F\}$$

$$\begin{bmatrix} + & + \\ + & + \end{bmatrix} \cdot \begin{Bmatrix} \mu_2 \\ w_2 \end{Bmatrix} = \begin{Bmatrix} x_2 \\ z_2 \end{Bmatrix}$$

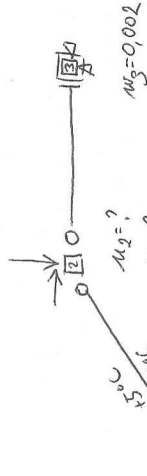
$$\begin{matrix} \square \cdot \mu_2 + \square \cdot w_2 = \square \\ \square \cdot \mu_2 + \square \cdot w_2 = \square \end{matrix}$$

$$\begin{matrix} \mu_2 = \square \text{ m} \\ w_2 = \square \text{ m} \end{matrix} \quad \{r\} = \begin{Bmatrix} \mu_2 \\ w_2 \end{Bmatrix}$$

Pr 2



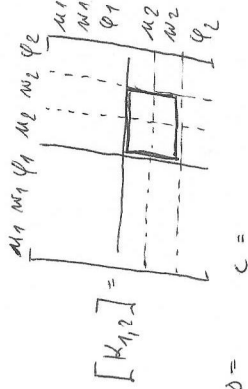
1



$$n_1 = 2; \{R\} = \begin{Bmatrix} u_2 \\ w_2 \end{Bmatrix}; \{S\} = \begin{Bmatrix} x_2 \\ z_2 \end{Bmatrix}$$

2) PRUT 1,2

$$\begin{matrix} \text{---} \\ \text{---} \\ \text{---} \\ \text{---} \\ \text{---} \end{matrix}$$



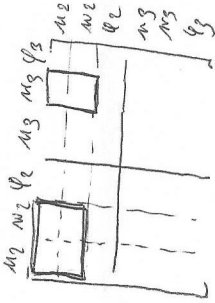
$$\{K_{1,2}\} = \begin{Bmatrix} x_1^* \\ z_1^* \\ m_1^* \\ x_2^* \\ z_2^* \\ m_2^* \end{Bmatrix}$$

$$\{R_{1,2}\} = \begin{Bmatrix} x_1 \\ z_1 \\ m_1 \\ x_2 \\ z_2 \\ m_2 \end{Bmatrix}$$

$\Delta =$

PRUT 2,3

$$\begin{matrix} \text{---} \\ \text{---} \\ \text{---} \\ \text{---} \\ \text{---} \end{matrix}$$



$$\{R_{2,3}\} = \begin{Bmatrix} x_2 \\ z_2 \\ m_2 \\ x_3 \\ z_3 \\ m_3 \end{Bmatrix}$$

$$\{K_{2,3}\} = \begin{Bmatrix} x_2 \\ z_2 \\ m_2 \\ x_3 \\ z_3 \\ m_3 \end{Bmatrix}$$

3)

$$[K] = \begin{bmatrix} - & + \\ + & - \end{bmatrix} \begin{Bmatrix} u_2 \\ w_2 \end{Bmatrix} ; \{R\} = \begin{Bmatrix} x_2 \\ z_2 \end{Bmatrix} ; \{F\} = \begin{Bmatrix} x_2 \\ z_2 \end{Bmatrix}$$

$$[K] \cdot \{R\} = \{F\}$$

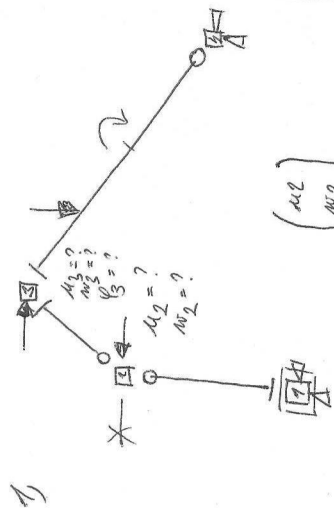
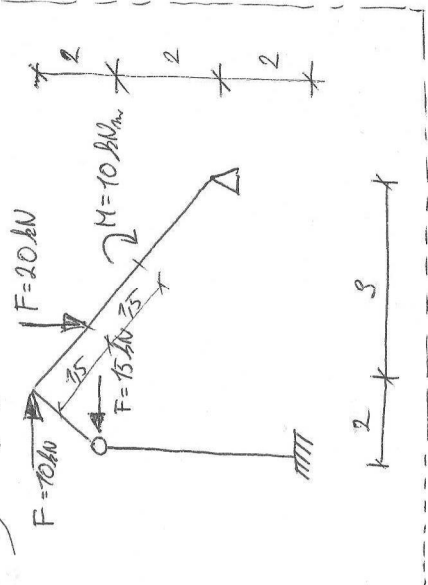
$$\begin{bmatrix} - & + \\ + & - \end{bmatrix} \begin{Bmatrix} u_2 \\ w_2 \end{Bmatrix} = \begin{Bmatrix} x_2 \\ z_2 \end{Bmatrix}$$

$$\begin{Bmatrix} x_2 \\ z_2 \end{Bmatrix} = \begin{Bmatrix} x_2 \\ z_2 \end{Bmatrix}$$

$$\begin{Bmatrix} u_2 \\ w_2 \end{Bmatrix} = \begin{Bmatrix} u_2 \\ w_2 \end{Bmatrix}$$

$$\{R\} = \begin{Bmatrix} u_2 \\ w_2 \end{Bmatrix}$$

P-3) $\{F\} = ?$



$$\begin{Bmatrix} u_2 \\ w_2 \\ u_3 \\ w_3 \\ \varphi_3 \end{Bmatrix} = \begin{Bmatrix} -15 \\ 0 \\ -10 \\ 0 \\ 0 \end{Bmatrix} \begin{Bmatrix} x_2 \\ z_2 \\ x_3 \\ z_3 \\ M_3 \end{Bmatrix}$$

$$n_4 = 5, \quad \{S\} = \begin{Bmatrix} u_2 \\ w_2 \\ u_3 \\ w_3 \\ \varphi_3 \end{Bmatrix}$$

PROT 1,2

$$\{\bar{R}_{1,2}\} = \{0, 0, 0, 0, 0, 0, 0, 0, 0\}^T$$

PROT 2,3

$$\{\bar{R}_{2,3}\} = \{0, 0, 0, 0, 0, 0, 0, 0, 0\}^T$$

PROT 3,4

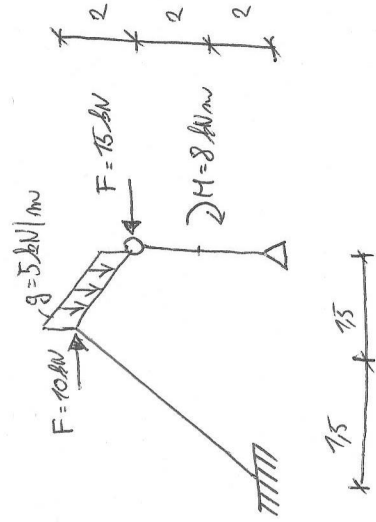
$$\begin{aligned} d &= \\ \delta_{3,4} &= \\ \Delta &= \\ C &= \end{aligned}$$

$$\{\bar{R}_{3,4}\}^* = \begin{Bmatrix} + & + & + \\ x_3^* & z_3^* & M_3^* \\ x_4^* & z_4^* & M_4^* \end{Bmatrix} \rightarrow \{\bar{R}_{3,4}\} = \begin{Bmatrix} x_3 \\ z_3 \\ M_3 \\ x_4 \\ z_4 \\ M_4 \end{Bmatrix}$$

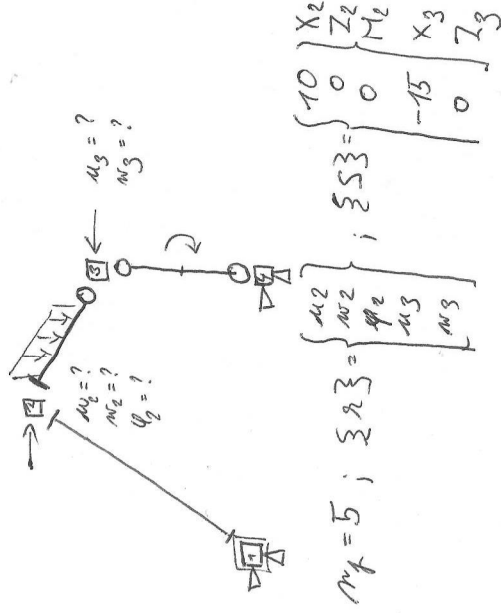
3)

$$\{\bar{R}\} = \begin{Bmatrix} x_2 \\ z_2 \\ x_3 \\ z_3 \\ M_3 \end{Bmatrix}, \quad \{F\} = \begin{Bmatrix} x_2 \\ z_2 \\ x_3 \\ z_3 \\ M_3 \end{Bmatrix}$$

R-3) $\{F\} = ?$



1)



2)

PRUT 1,2
 $\{\bar{R}_{1,2}\} = \{0; 0; 0; 0; 0; 0\}^T$

PRUT 2,3
 $L = 2.5 \text{ m}$
 $\delta_{23} = 63, 1301^\circ$
 $A = 0, 8$
 $C = 0, 6$

$\{\bar{R}_{4,3}\}^* = \begin{Bmatrix} x_4^* \\ z_4^* \\ m_4^* \\ x_3^* \\ z_3^* \\ m_3^* \end{Bmatrix} \rightarrow \{\bar{R}_{2,3}\} = \begin{Bmatrix} x_2 \\ z_2 \\ m_2 \\ x_3 \\ z_3 \\ m_3 \end{Bmatrix}$

PRUT 3,4
 $L = 4 \text{ m}$
 $\delta_{34} = 90^\circ$
 $A = 1$
 $C = 0$

$\{\bar{R}_{3,4}\}^* = \begin{Bmatrix} x_3^* \\ z_3^* \\ m_3^* \\ x_4^* \\ z_4^* \\ m_4^* \end{Bmatrix} \rightarrow \{\bar{R}_{3,4}\} = \begin{Bmatrix} x_3 \\ z_3 \\ m_3 \\ x_4 \\ z_4 \\ m_4 \end{Bmatrix}$

3)

$\{\bar{R}\} = \begin{Bmatrix} x_2 \\ z_2 \\ m_2 \\ x_3 \\ z_3 \end{Bmatrix}$; $\{F\} = \begin{Bmatrix} x_2 \\ z_2 \\ m_2 \\ x_3 \\ z_3 \end{Bmatrix}$

4)

$$\{R_{12}^*\} = \begin{Bmatrix} X_1^* \\ Z_1^* \\ H_1^* \\ X_2^* \\ Z_2^* \\ H_2^* \end{Bmatrix} = \begin{Bmatrix} 0 \\ -28 \\ 24 \\ 0 \\ -7 \\ 15 \end{Bmatrix}$$

