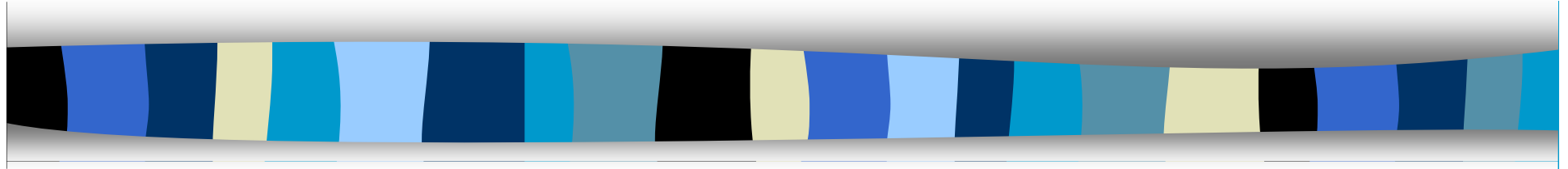
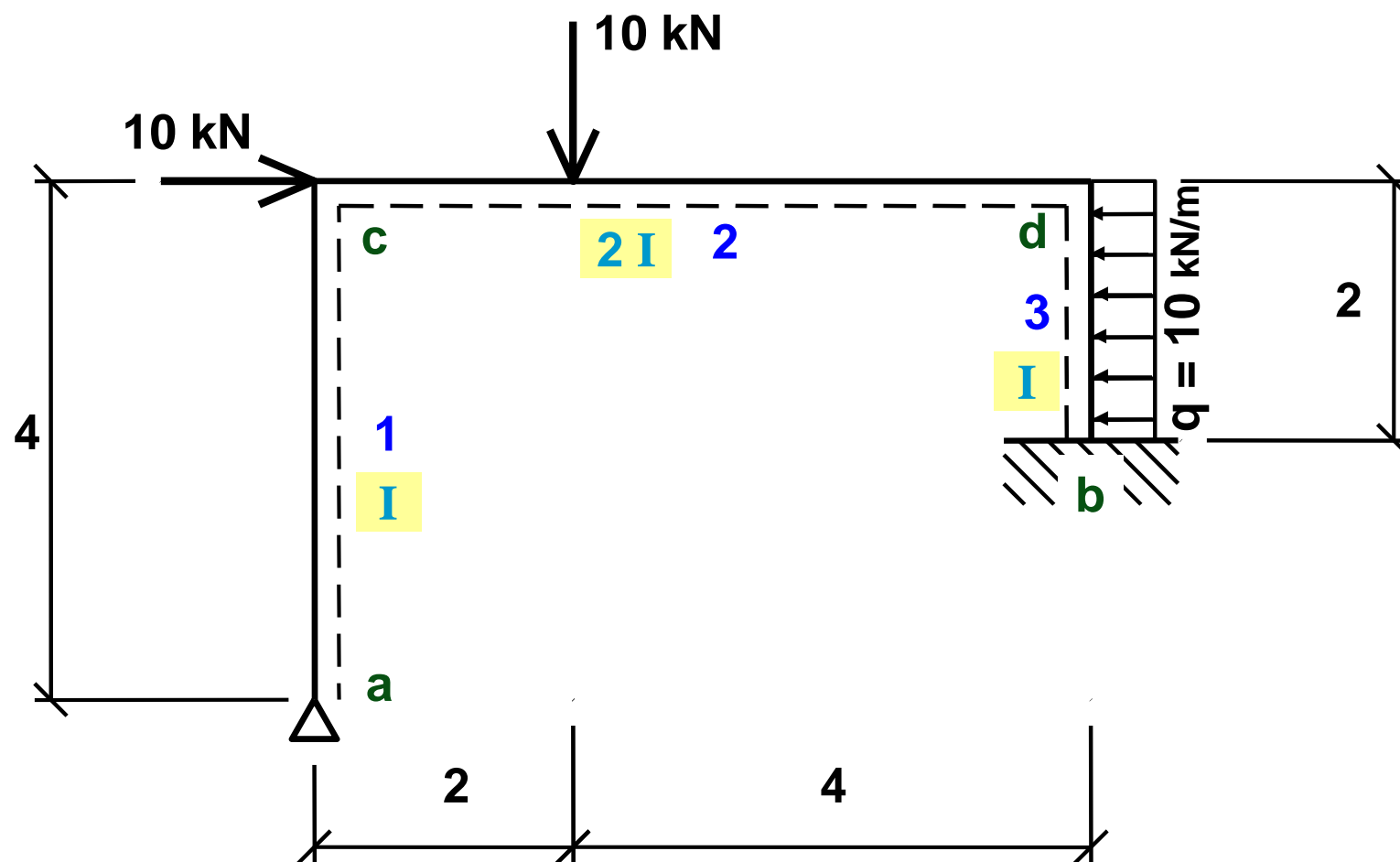


Zjednodušená deformační metoda




Řešení rámu
s posuvnými styčníky

Příklad






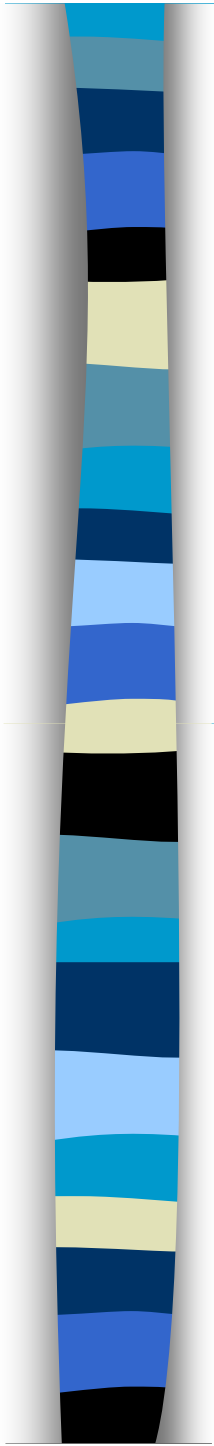
Sekundární momenty a posouvající síly

$$\hat{M}_{ab} = k_{ab} (2\varphi_a + \varphi_b - 3\psi_{ab})$$


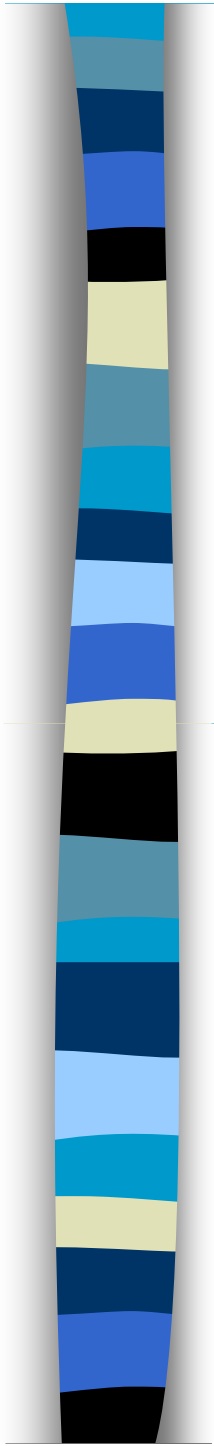
$$\hat{V}_{ab} = -\frac{k_{ab}}{l_{ab}} (3\varphi_a + 3\varphi_b - 6\psi_{ab})$$

$$\hat{M}_{ab} = k_{ab} (2\varphi_a - 2\psi_{ab})$$


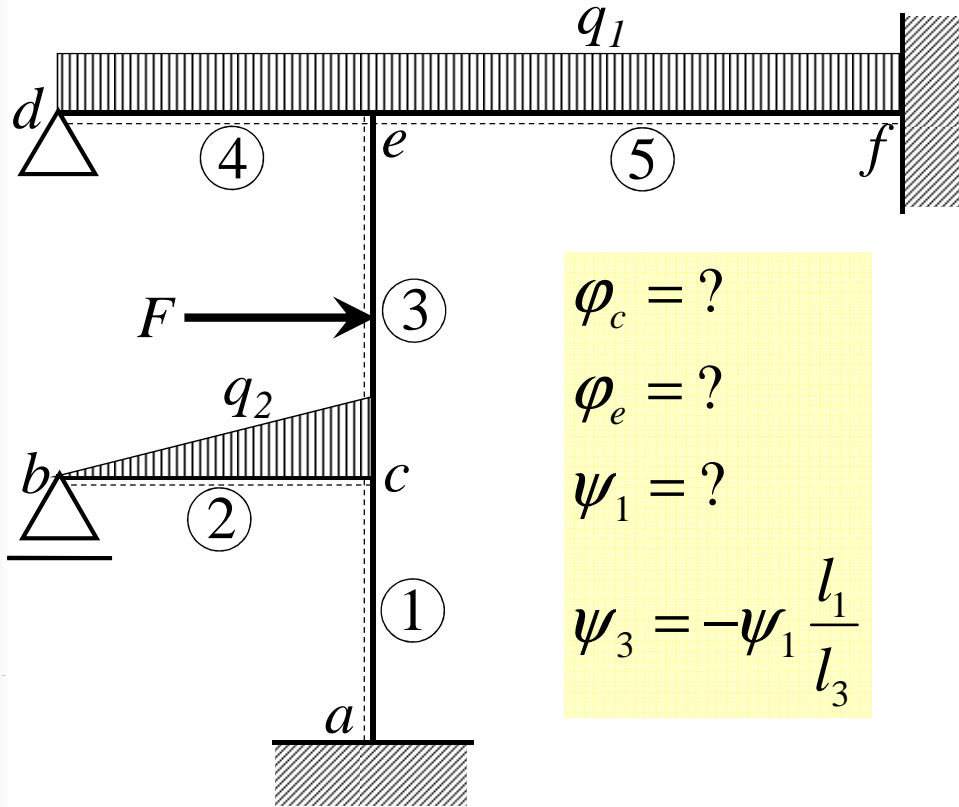
$$\hat{V}_{ab} = -\frac{k_{ab}}{l_{ab}} (2\varphi_a - 2\psi_{ab})$$



	φ_c	φ_d	ψ_1	<i>P.S.</i>
φ_c	$2k_1 + 2k_2$	k_2	$-2k_1$	$-\left(\overline{M}_{ca} + \overline{M}_{cd}\right)$
φ_d	k_2	$2k_2 + 2k_3$	$-3k_3 \frac{l_1}{l_3}$	$-\left(\overline{M}_{dc} + \overline{M}_{db}\right)$
ψ_1	$-2 \frac{k_1}{l_1}$	$-3 \frac{k_3}{l_3}$	$2 \frac{k_1}{l_1} + 6 \frac{k_3}{l_3} \frac{l_1}{l_3}$	$F - \left(\overline{V}_{ca} + \overline{V}_{db}\right)$



	φ_c	φ_d	ψ_1	<i>P.S.</i>
φ_c	$2k_1 + 2k_2$	k_2	$-2k_1$	$-\left(\overline{M}_{ca} + \overline{M}_{cd}\right)$
φ_d	k_2	$2k_2 + 2k_3$	$-3k_3 \frac{l_1}{l_3}$	$-\left(\overline{M}_{dc} + \overline{M}_{db}\right)$
ψ_1	$-2k_1$	$-3k_3 \frac{l_1}{l_3}$	$2k_1 + 6k_3 \frac{l_1^2}{l_3^2}$	$Fl_1 - \left(\overline{V}_{ca} + \overline{V}_{db}\right)l_1$



$$k_1 = \frac{I_1}{l_1} c$$

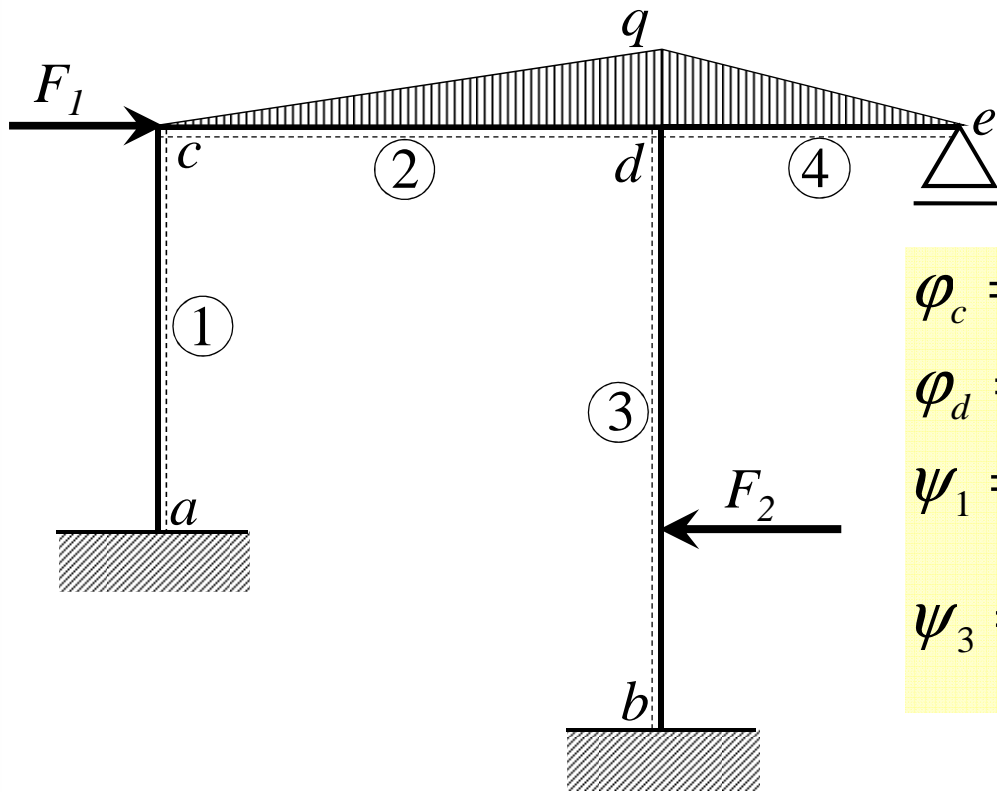
$$k_2 = \frac{3}{4} \frac{I_2}{l_2} c$$

$$k_3 = \frac{I_3}{l_3} c$$

$$k_4 = \frac{3}{4} \frac{I_4}{l_4} c$$

$$k_5 = \frac{I_5}{l_5} c$$

$2k_1 + 2k_2 + 2k_3$	k_3	$-3k_1 + 3k_3 \frac{l_1}{l_3}$	$-(\bar{M}_{ca} + \bar{M}_{cb} + \bar{M}_{ce})$
k_3	$2k_3 + 2k_4 + 2k_5$	$3k_3 \frac{l_1}{l_3}$	$-(\bar{M}_{ed} + \bar{M}_{ef} + \bar{M}_{ec})$
$-3k_1 + 3k_3 \frac{l_1}{l_3}$	$3k_3 \frac{l_1}{l_3}$	$6k_1 + 6k_3 \left(\frac{l_1}{l_3}\right)^2$	$-(\bar{V}_{ca} - \bar{V}_{ce}) \cdot l_1$



$$\varphi_c = ?$$

$$\varphi_d = ?$$

$$\psi_1 = ?$$

$$\psi_3 = \psi_1 \frac{l_1}{l_3}$$

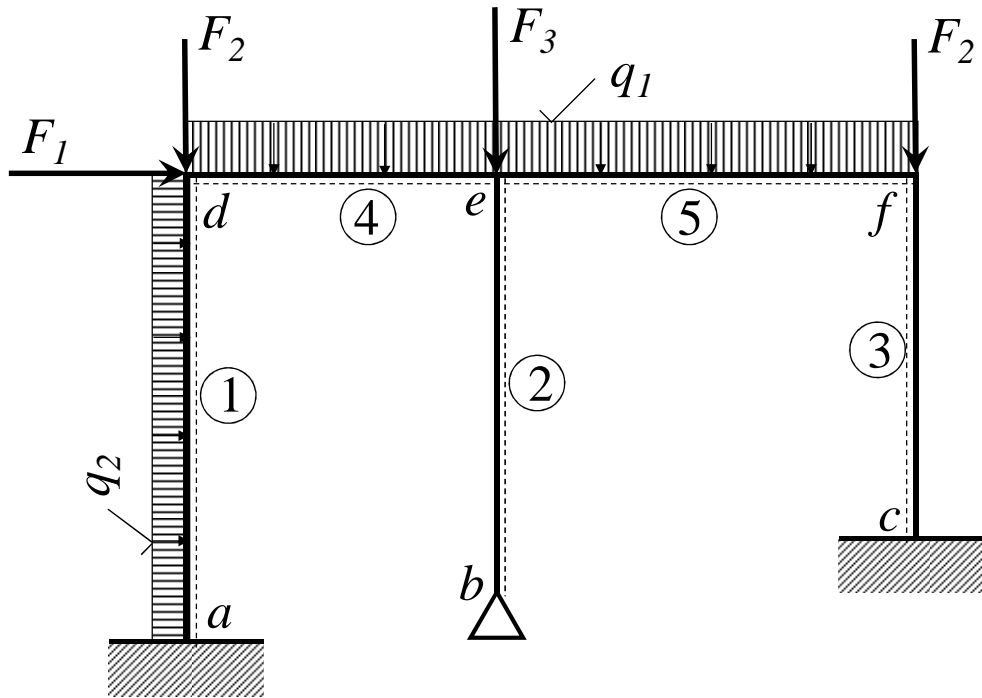
$$k_1 = \frac{I_1}{l_1} c$$

$$k_2 = \frac{I_2}{l_2} c$$

$$k_3 = \frac{I_3}{l_3} c$$

$$k_4 = \frac{3}{4} \frac{I_4}{l_4} c$$

$2k_1 + 2k_2$	k_2	$-3k_1$	$-(\overline{M}_{ca} + \overline{M}_{cd})$
k_2	$2k_2 + 2k_3 + 2k_4$	$-3k_3 \frac{l_1}{l_3}$	$-(\overline{M}_{dc} + \overline{M}_{db} + \overline{M}_{de})$
$-3k_1$	$-3k_3 \frac{l_1}{l_3}$	$6k_1 + 6k_3 \left(\frac{l_1}{l_3}\right)^2$	$-(\overline{V}_{ca} + \overline{V}_{db}) \cdot l_1 + F_1 l_1$

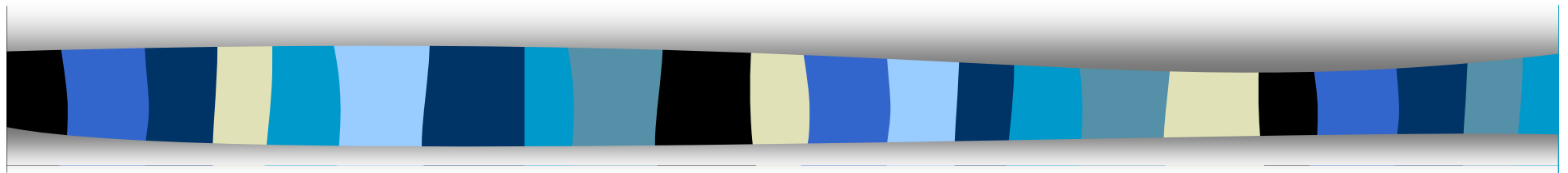


$$\begin{aligned} \varphi_d &= ? \\ \varphi_e &= ? \\ \varphi_f &= ? \\ \psi_1 &= ? \\ \psi_2 &= \psi_1 \frac{l_1}{l_2} \\ \psi_3 &= \psi_1 \frac{l_1}{l_3} \end{aligned}$$

$$\begin{aligned} k_1 &= \frac{I_1}{l_1} c \\ k_2 &= \frac{3}{4} \frac{I_2}{l_2} c \\ k_3 &= \frac{I_3}{l_3} c \\ k_4 &= \frac{I_4}{l_4} c \\ k_5 &= \frac{I_5}{l_5} c \end{aligned}$$

$2k_1 + 2k_4$	k_4	-	$-3 \cdot k_1$	$-(\bar{M}_{da} + \bar{M}_{de})$
k_4	$2k_2 + 2k_4 + 2k_5$	k_5	$-2 \cdot k_2 \frac{l_1}{l_2}$	$-(\bar{M}_{ed} + \bar{M}_{ef} + \bar{M}_{eb})$
-	k_5	$2k_3 + 2k_5$	$-3 \cdot k_3 \frac{l_1}{l_3}$	$-(\bar{M}_{fe} + \bar{M}_{fc})$
$-3 \cdot k_1$	$-2 \cdot k_2 \frac{l_1}{l_2}$	$-3 \cdot k_3 \frac{l_1}{l_3}$	$6k_1 + 2k_2 \left(\frac{l_1}{l_2}\right)^2 + 6k_3 \left(\frac{l_1}{l_3}\right)^2$	$-(\bar{V}_{da} + \bar{V}_{eb} + \bar{V}_{fc} - F_1) \cdot l_1$

Obecná deformační metoda



Určení stupně přetvárné neurčitosti



Stupeň přetvárné neurčitosti

$$n_p = 3t + 2k + p - p_v$$

t ... počet monolitických styčníků

k ... počet kloubových styčníků

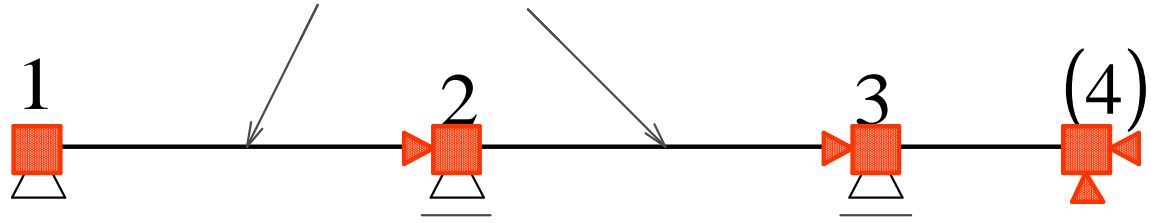
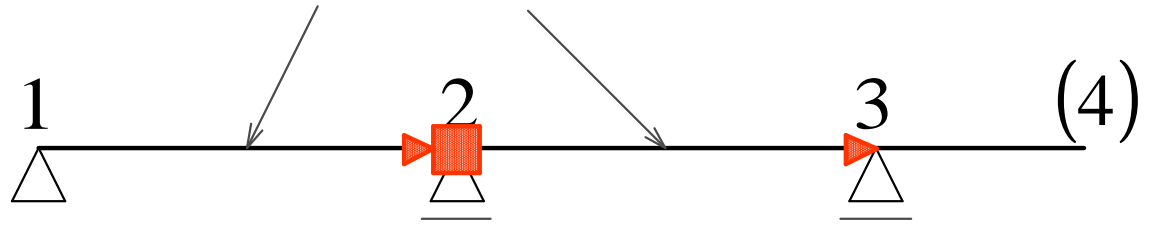
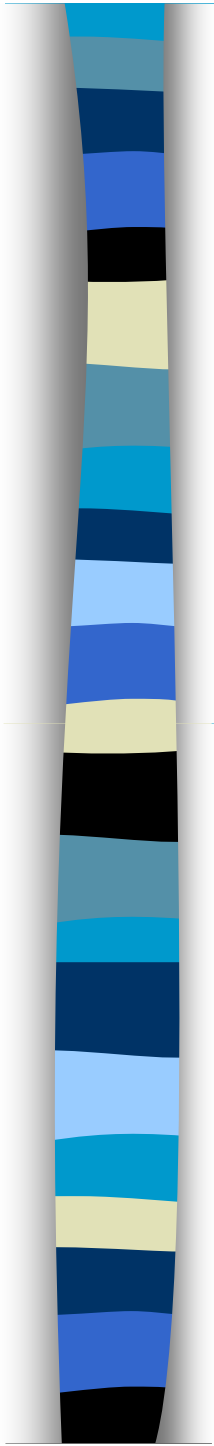
p ... počet jednoduchých posuvných podepření

p_v ... počet vnějších vazeb umístěných u styčníků
přepočtených na jednonásobné vazby

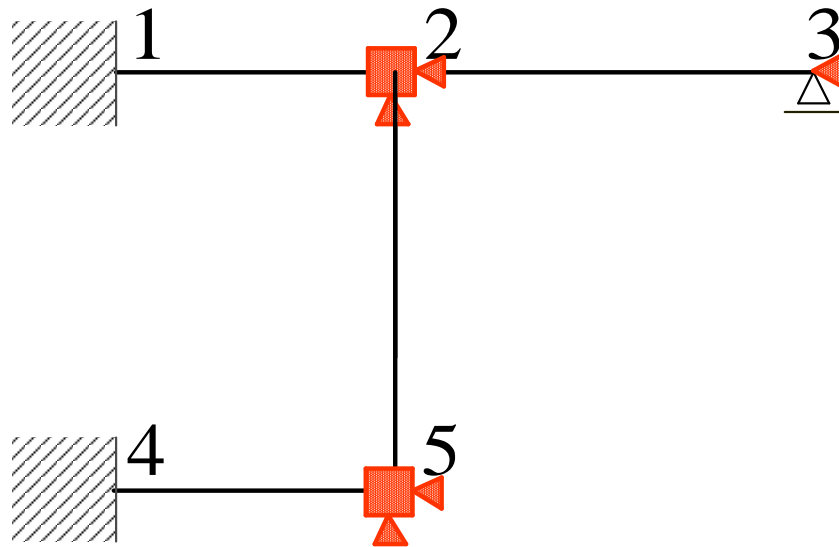
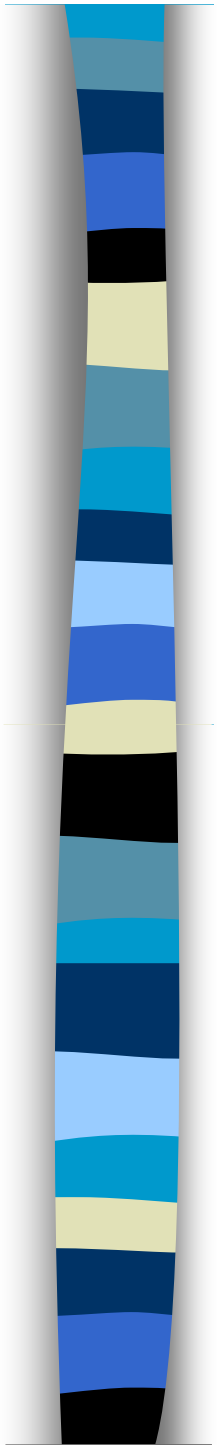


Fiktivní vazby

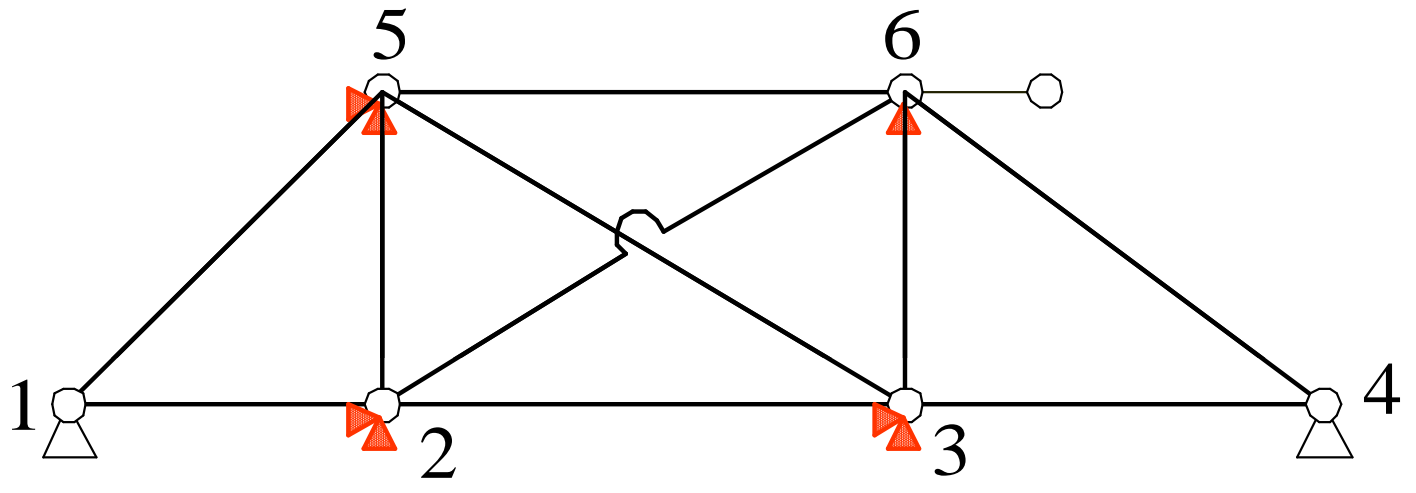
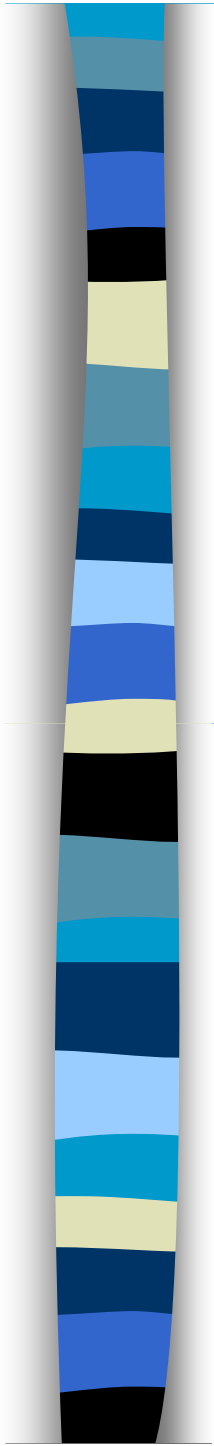
- ▣ momentová (brání pootočení)
- ▴ silová (brání svislému posunu)
- silová (brání horizontálnímu posunu)



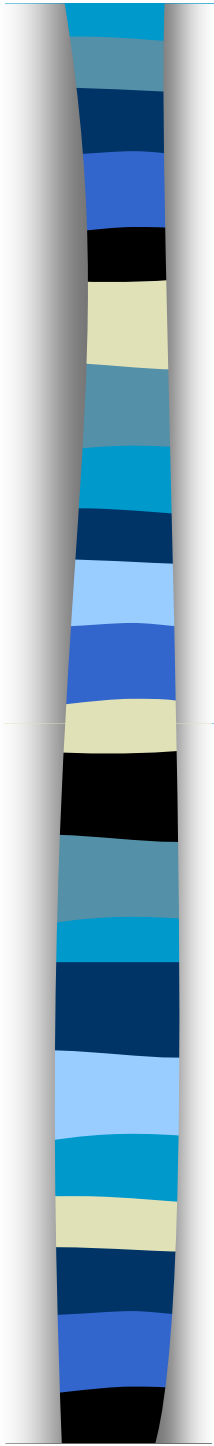
$$n_p = 3(8)$$



$$n_p = 7(8)$$



$$n_p = 7$$



$$n_p = 9$$

