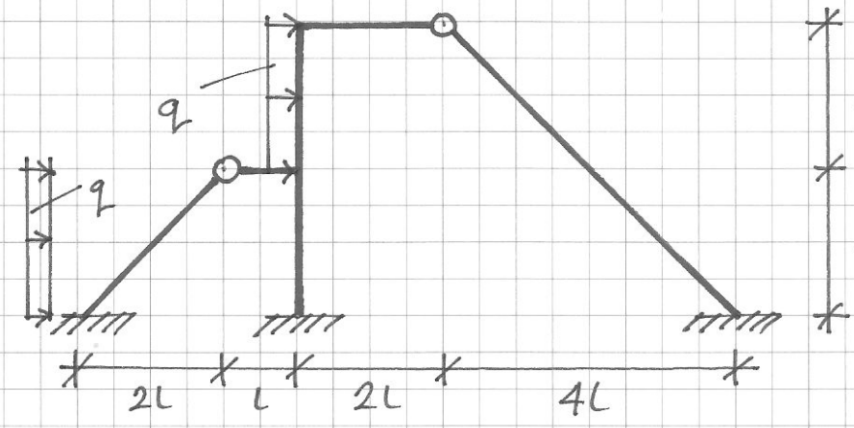
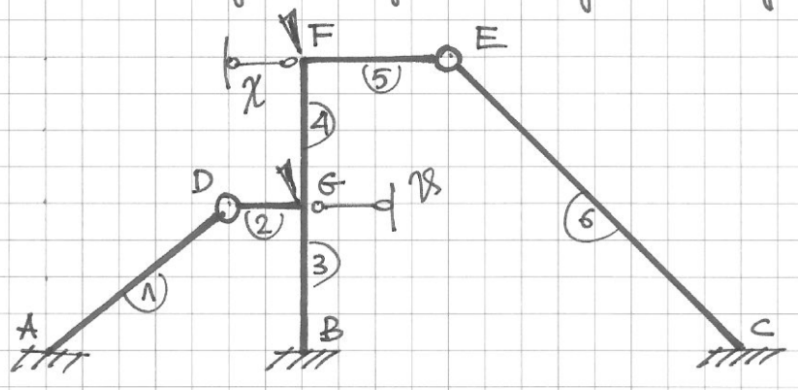
Kolokwium z MK1 1.3a , r. ak. 2014/2015

Zapisać równania równowagi Metody Przemieszczeń $EJ = const.$

$\varepsilon_E = 0 \quad (EA = \infty)$

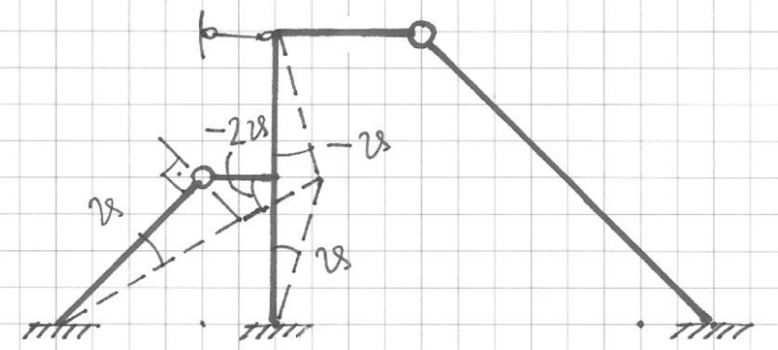


Schemat geometrycznie wyznaczalny:



$$\mathbf{q} = \begin{bmatrix} \varphi_F \\ \varphi_G \\ \vartheta \\ \chi \end{bmatrix}$$

Plan ϑ:



$\psi^{(1)} = \vartheta$

$\psi^{(2)} = -2\vartheta$

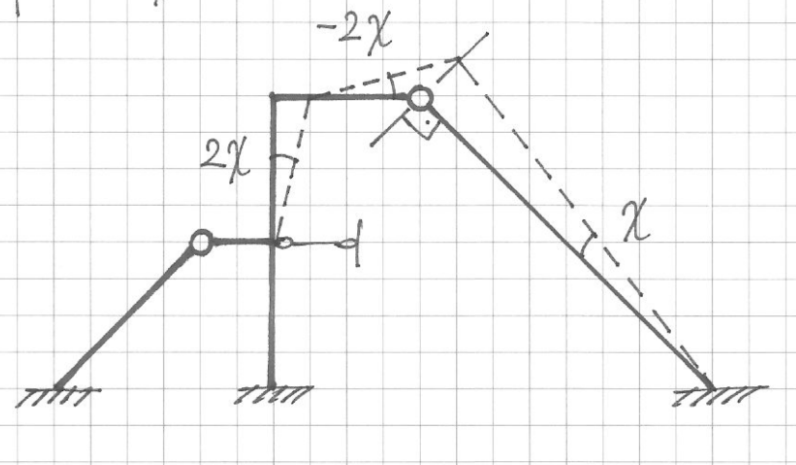
$\psi^{(3)} = \vartheta$

$\psi^{(4)} = -\vartheta + 2\chi$

$\psi^{(5)} = -2\chi$

$\psi^{(6)} = \chi$

plan χ:



Równania równowagi:

$$\Phi_F^{(4)} + \Phi_F^{(5)} = 0$$

$$\Phi_G^{(2)} + \Phi_G^{(3)} + \Phi_G^{(4)} = 0$$

$$\Phi_A^{(1)} \cdot \overline{\vartheta} + \Phi_G^{(2)} \cdot (-2\overline{\vartheta}) + \left[\Phi_B^{(3)} + \Phi_G^{(3)}\right] \cdot \overline{\vartheta} + \left[\Phi_G^{(4)} + \Phi_F^{(4)}\right] \cdot (-\overline{\vartheta}) + \overline{L}_{\vartheta} = 0$$

$$\left[\Phi_G^{(4)} + \Phi_F^{(4)}\right] \cdot 2\overline{\chi} + \Phi_F^{(5)} \cdot (-2\overline{\chi}) + \Phi_C^{(6)} \cdot \overline{\chi} + \overline{L}_{\chi} = 0$$

$$\overline{L}_{\vartheta} = q \cdot 2l \cdot l \cdot \overline{\vartheta} + q \cdot 2l \cdot l \cdot \overline{\vartheta}$$

$$\overline{L}_{\chi} = q \cdot 2l \cdot l \cdot 2\overline{\chi}$$

Wzory transformacyjne:

$$\Phi_A^{(1)} = \frac{3EJ}{2l\sqrt{2}} \left[-\vartheta\right] - \frac{1}{2} q l^2$$

$$\Phi_G^{(2)} = \frac{3EJ}{l} \left[\varphi_G + 2\vartheta\right]$$

$$\Phi_B^{(3)} = \frac{2EJ}{2l} \left[\varphi_G - 3\vartheta\right]$$

$$\Phi_G^{(3)} = \frac{2EJ}{2l} \left[2\varphi_G - 3\vartheta\right]$$

$$\Phi_F^{(4)} = \frac{2EJ}{2l} \left[2\varphi_F + \varphi_G - 3(-\vartheta + 2\chi)\right] + \frac{1}{3} q l^2$$

$$\Phi_G^{(4)} = \frac{2EJ}{2l} \left[\varphi_F + 2\varphi_G - 3(-\vartheta + 2\chi)\right] - \frac{1}{3} q l^2$$

$$\Phi_F^{(5)} = \frac{3EJ}{2l} \left[\varphi_F + 2\chi\right]$$

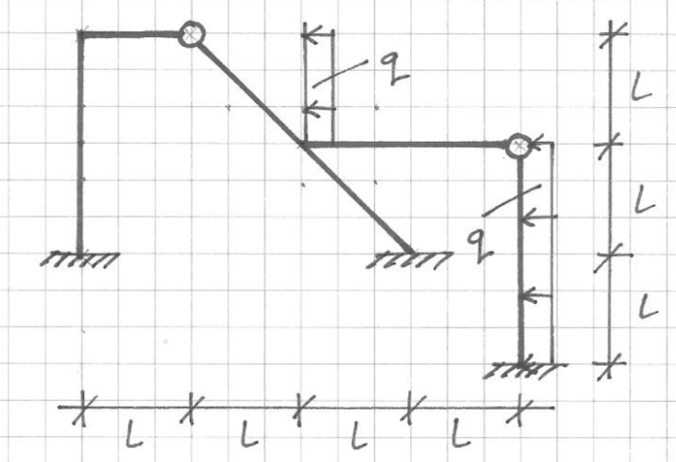
$$\Phi_C^{(6)} = \frac{3EJ}{4\sqrt{2}l} \left[-\chi\right]$$

Kolokwium z MK1 2.3b , r. ak. 2014/15

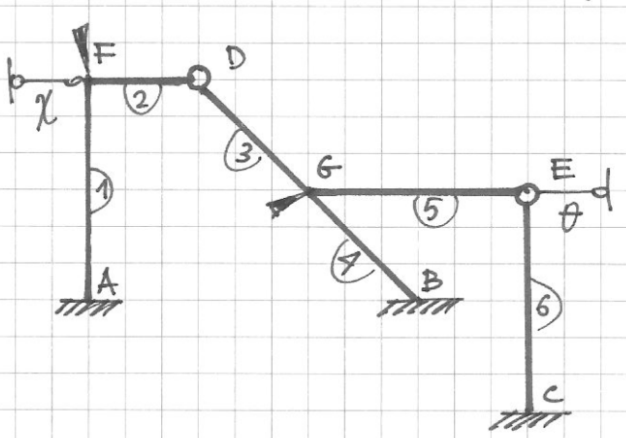
Zapisać równania Metody Przemieszczeń :

$EJ = \text{const.}$

$\varepsilon_E = 0 \quad (EA = \infty)$

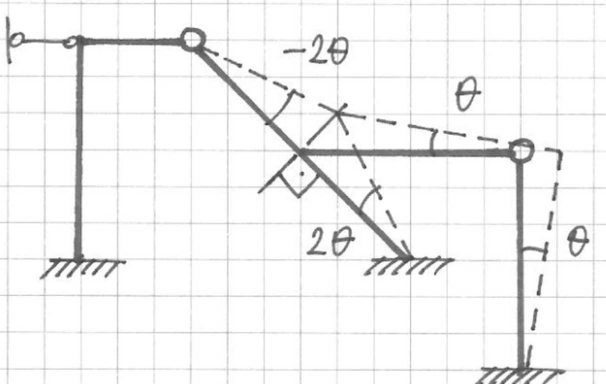


Schemat geometrycznie wyznaczalny:

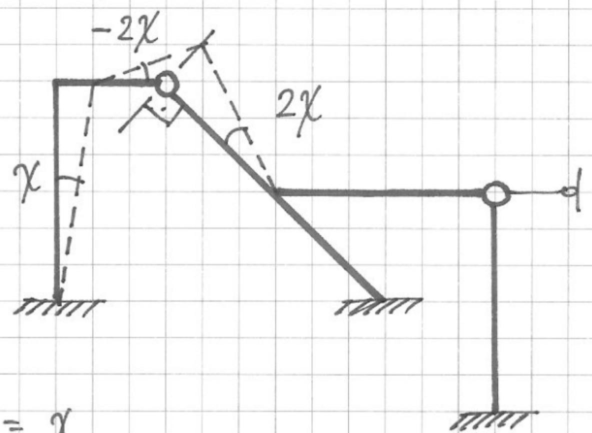


$$q = \begin{bmatrix} \varphi_F \\ \varphi_G \\ \theta \\ \chi \end{bmatrix}$$

plan θ



plan χ



$$\psi^{(1)} = \chi$$

$$\psi^{(2)} = -2\chi$$

$$\psi^{(3)} = -2\theta + 2\chi$$

$$\psi^{(4)} = 2\theta$$

$$\psi^{(5)} = \theta$$

$$\psi^{(6)} = \theta$$

Równania równowagi:

$$\Phi_F^{(1)} + \Phi_F^{(2)} = 0$$

$$\Phi_G^{(3)} + \Phi_G^{(4)} + \Phi_G^{(5)} = 0$$

$$\Phi_G^{(3)} \cdot (-2\bar{\theta}) + \left[\Phi_B^{(4)} + \Phi_G^{(4)}\right] \cdot 2\bar{\theta} + \Phi_G^{(5)} \cdot \bar{\theta} + \Phi_C^{(6)} \cdot \bar{\theta} + \bar{L}_\theta = 0$$

$$\left(\Phi_A^{(1)} + \Phi_F^{(1)}\right)\bar{\chi} + \Phi_F^{(2)} \cdot (-2\bar{\chi}) + \Phi_G^{(3)} \cdot 2\bar{\chi} + \bar{L}_\chi = 0$$

$$\bar{L}_\theta = -q \cdot l \cdot \tfrac{1}{2} l \cdot 2\bar{\theta} - q \cdot 2l \cdot l \cdot \bar{\theta}$$

$$\bar{L}_\chi = -q \cdot l \cdot \tfrac{1}{2} l \cdot 2\bar{\chi}$$

Wzory transformacyjne:

$$\Phi_A^{(1)} = \frac{2EJ}{2l}\left[\varphi_F - 3\chi\right]$$

$$\Phi_F^{(1)} = \frac{2EJ}{2l}\left[2\varphi_F - 3\chi\right]$$

$$\Phi_F^{(2)} = \frac{3EJ}{l}\left[\varphi_F + 2\chi\right]$$

$$\Phi_G^{(3)} = \frac{3EJ}{l\sqrt{2}}\left[\varphi_G + 2\theta - 2\chi\right] + \frac{1}{8} q l^2$$

$$\Phi_B^{(4)} = \frac{2EJ}{l\sqrt{2}}\left[\varphi_G - 6\theta\right]$$

$$\Phi_G^{(4)} = \frac{2EJ}{l\sqrt{2}}\left[2\varphi_G - 6\theta\right]$$

$$\Phi_G^{(5)} = \frac{3EJ}{2l}\left[\varphi_G - \theta\right]$$

$$\Phi_C^{(6)} = \frac{3EJ}{2l}\left[-\theta\right] + \frac{1}{2} q l^2$$