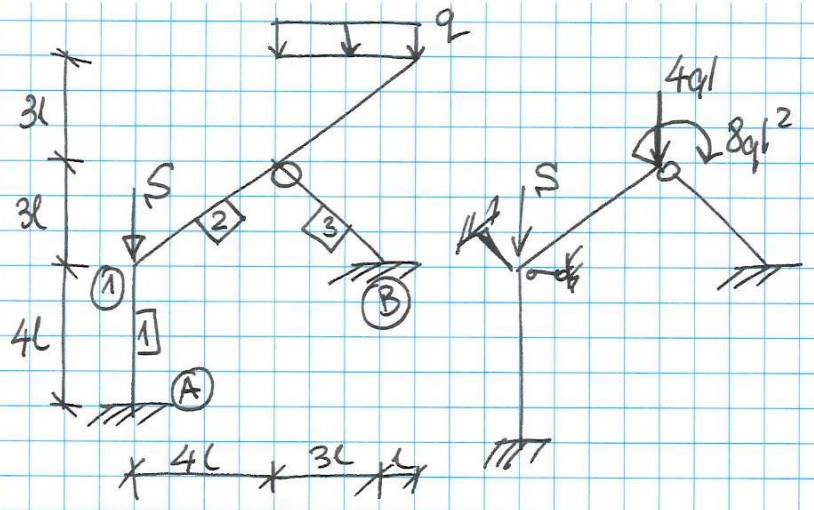
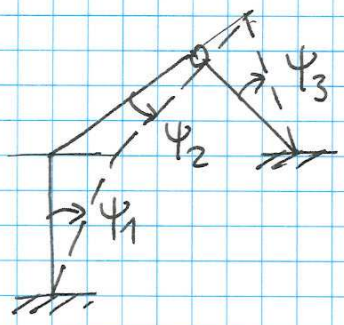


$$S = \frac{1}{100}\frac{EI}{l^2}$$

$$\sigma_1 = 0{,}4$$

Obliczyć: M_A



$$\psi_1 = \psi$$
$$\psi_2 = -\frac{4}{7}\psi$$
$$\psi_3 = \frac{16}{21}\psi$$

$$\begin{cases} \Phi_1^1 + \Phi_1^2 = 0 \\ \left(\Phi_A^1 + \Phi_1^1\right)\bar{\Psi} + \Phi_1^2\left(-\frac{4}{7}\bar{\Psi}\right) + \Phi_B^3\,\frac{16}{21}\bar{\Psi} + S\cdot 4l\cdot\Psi\cdot\bar{\Psi} - 4ql\cdot 3l\cdot\frac{16}{21}\bar{\Psi} + \\ \quad + 8ql^2\left(-\frac{4}{7}\bar{\Psi}\right) = 0 \end{cases}$$

$$\Phi_A^1 = \frac{EI}{4l}\left[\beta(\sigma_1)\varphi_1 - \theta(\sigma_1)\psi\right]$$

$$\Phi_1^1 = \frac{EI}{4l}\left[\alpha(\sigma_1)\varphi_1 - \theta(\sigma_1)\psi\right]$$

$$\Phi_1^2 = \frac{3EI}{5l}\left[\varphi_1 + \frac{4}{7}\psi\right] + 4ql^2$$

$$\Phi_B^3 = \frac{3EI}{3\sqrt{2}l}\left(-\frac{16}{21}\psi\right)$$

$$\frac{EI}{l}\begin{bmatrix} \frac{1}{4}\alpha(0.4) + \frac{3}{5} & -\theta(0.4) + \frac{4}{7}\cdot\frac{3}{5} \\ -\theta(0.4) + \frac{4}{7}\cdot\frac{3}{5} & \frac{1}{2}\alpha(0.4) + \frac{48}{245} + \frac{256}{441\sqrt{2}} - 4\sigma^2 \end{bmatrix}\begin{bmatrix}\varphi_1 \\ \psi\end{bmatrix} + \begin{bmatrix}4 \\ 16\end{bmatrix}ql^2 = 0$$

$\sigma = 0.1$

$$\varphi_1 = -7{,}52\,\frac{ql^3}{EI}$$

$$\psi = -6{,}93\,\frac{ql^3}{EI}$$

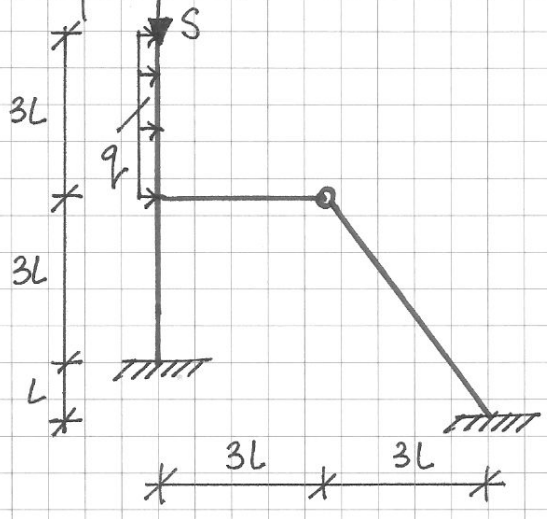
$$\Phi_A^1 = 6.6\,ql^2$$

OPRACOWAŁ: JAN PIELCZYŃSKI, MARTA SITEK

Kolokwium z MK2, 1.2, r.ak. 2013/14

Zapisać układ równań metody przemieszczeń $EJ = const.$

$S = \frac{1}{100}\frac{EJ}{L^2}$

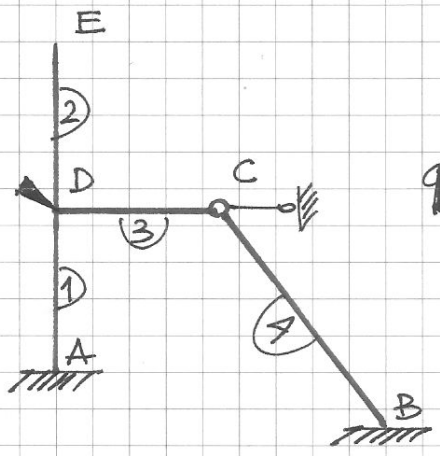


Wartości dużych sił osiowych i parametrów $\sigma^{(k)}$ w prętach:

$S^{(1)} = S \qquad \sigma^{(1)} = 0{,}3$

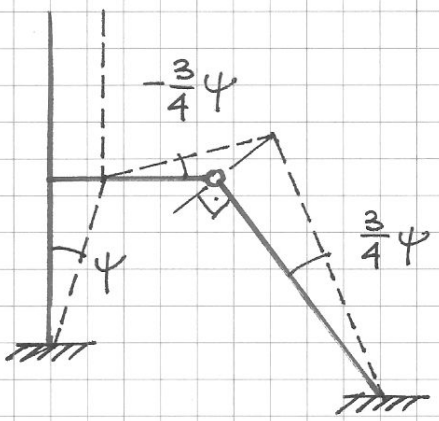
$S^{(2)} = S \qquad \sigma^{(2)} = 0{,}3$

Schemat geometrycznie wyznaczalny:



$\mathbf{q} = \begin{bmatrix} \varphi_D \\ \psi \end{bmatrix}$

Plan przesunięć:



Równania równowagi:

$$\Phi_D^{(1)} + \Phi_D^{(2)} + \Phi_D^{(3)} = 0$$

$$\left[\Phi_A^{(1)} + \Phi_D^{(1)}\right] \cdot \bar{\psi} + \Phi_D^{(3)} \cdot \left(-\tfrac{3}{4}\bar{\psi}\right) + \Phi_B^{(4)} \cdot \tfrac{3}{4}\bar{\psi}$$
$$+ S \cdot 3L \cdot \psi \cdot \bar{\psi}$$
$$+ q \cdot 3L \cdot 3L \cdot \bar{\psi} = 0$$

Wzory transformacyjne:

$$\Phi_A^{(1)} = \frac{EJ}{3L}\left[\beta(0{,}3)\varphi_D - \nu(0{,}3)\psi\right]$$

$$\Phi_D^{(1)} = \frac{EJ}{3L}\left[\alpha(0{,}3)\varphi_D - \nu(0{,}3)\psi\right]$$

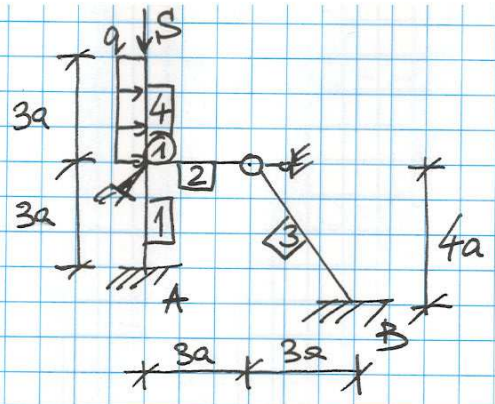
$$\Phi_D^{(2)} = \frac{EJ}{3L}\left[\alpha'''(0{,}3)\varphi_D\right] - \gamma'''(0{,}3)\,q\,(3L)^2$$

$$\Phi_D^{(3)} = \frac{3EJ}{3L}\left[\varphi_D + \tfrac{3}{4}\psi\right]$$

$$\Phi_B^{(4)} = \frac{3EJ}{5L}\left[-\tfrac{3}{4}\psi\right]$$

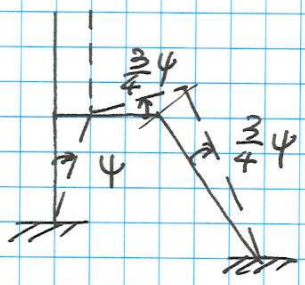
Kol 1.2

8.05.2014 r.



$S = \frac{1}{100}\frac{EI}{a^2}$

$M_A = ?$



$\sigma_* = 0.1$

$\sigma_1 = 0.3$

$\sigma_4 = 0.3$

$$\begin{cases} \phi_1^1 + \phi_1^2 + \phi_1^4 = 0 \\ (\phi_A^1 + \phi_1^1)\bar{\psi} + \phi_1^2\left(-\frac{3}{4}\bar{\psi}\right) + \phi_B^3\left(\frac{3}{4}\bar{\psi}\right) + S \cdot 3a \cdot \psi \cdot \bar{\psi} + 3q_1 a \cdot 3a \cdot \bar{\psi} = 0 \end{cases}$$

$$\phi_A^1 = \frac{EI}{3a}\left[\beta(\sigma_1)\varphi_1 - \theta(\sigma_1)\psi\right] \qquad \phi_B^3 = \frac{3EI}{5a}\left(-\frac{3}{4}\psi\right)$$

$$\phi_1^1 = \frac{EI}{3a}\left[\alpha(\sigma_1)\varphi_1 - \theta(\sigma_1)\psi\right] \qquad \phi_1^4 = \frac{EI}{3a}\alpha'''(\sigma_4)\varphi_1 - \gamma'''(\sigma_4)q_1(3a)^2$$

$$\phi_1^2 = \frac{3EI}{3a}\left[\varphi_1 + \frac{3}{4}\psi\right]$$

$$\frac{EI}{a}\begin{bmatrix} 2.2983 & -1.247 \\ -1.247 & 4.864 \end{bmatrix}\begin{bmatrix} \varphi_1 \\ \psi \end{bmatrix} = \begin{bmatrix} 4.605 \\ 9 \end{bmatrix} q_1 a^2$$

$$\varphi_1 = 3.49\frac{q_1 a^3}{EI} \qquad \psi = 2.75\frac{q_1 a^3}{EI}$$

$$M_A = \phi_A^1 = -3.15\, q_1 a^2$$