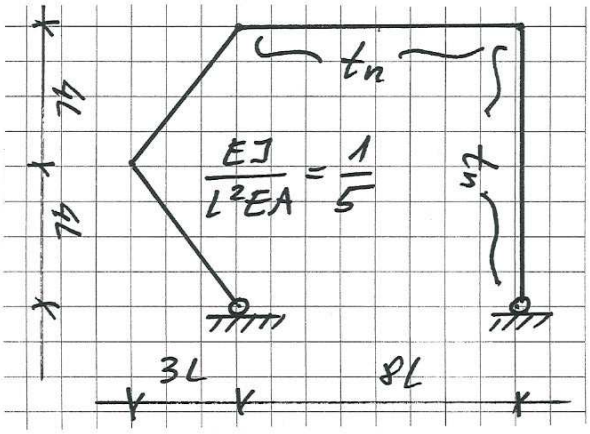
Egzamin pisemny z Mechaniki Konstrukcji I, 5 lutego 2014 r.

NAZWISKO i Imię:				
ocena zadania 1	ocena zadania 2	ocena zadania 3	ocena egz. pis.	Ocena Ostateczna
				Ocena łączna Data

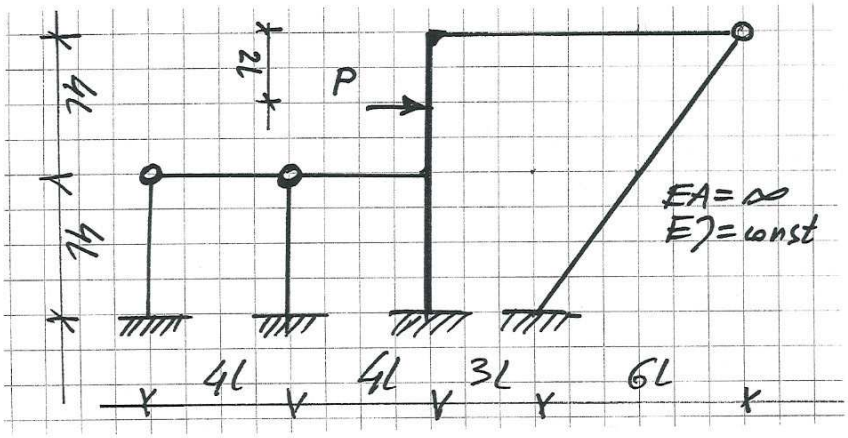
Zadanie 1
Dana jest rama z prętów ściśliwych;
obciążenie termiczne -
równomierne
na zaznaczonych prętach
Sporządzić wykres M.

The given frame
of extensible bars is subjected to
a thermal load indicated.
Construct the diagram
of the bending moment M.



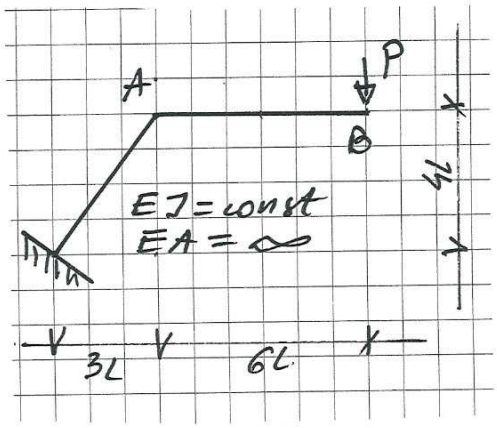
Zadanie 2
Dana jest rama z prętów
Nieściśliwych.
Zapisać równania określające
rozwiązanie zadania.

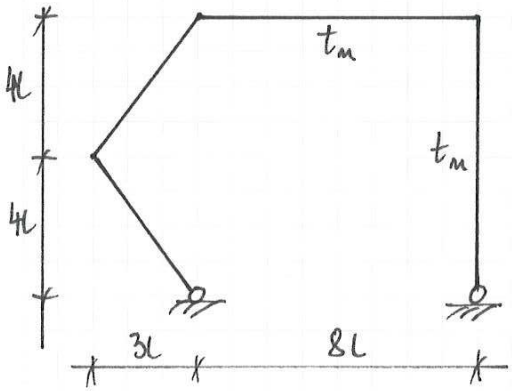
The given frame is made
of inextensible bars.
Find the equations
determining the solution.



Zadanie 3
Dana jest rama
z prętów niewydłużalnych, o *EJ*=const.
Sporządzić wykres ugięcia pręta AB.

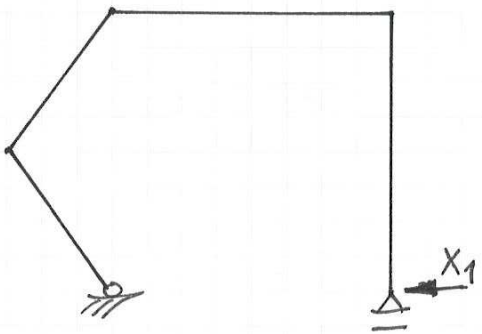
The given frame
is made of inextensible bars.
EJ=const.
Find the deflection function
of the bar AB.

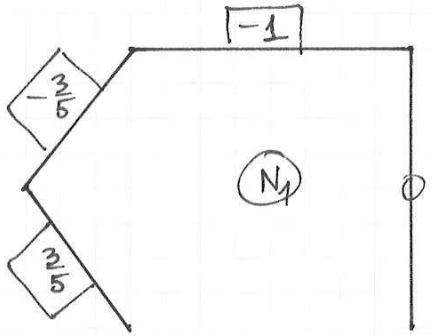


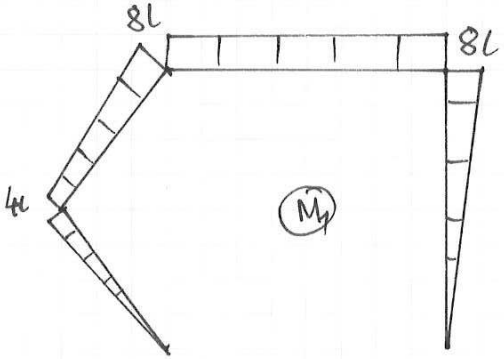


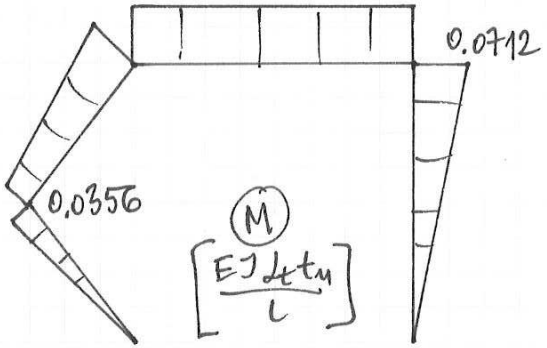
$\frac{EJ}{l^2 EA} = \frac{1}{5}$

SSW:









$\delta_{11} = 898,32 \frac{l^3}{EJ}$

$\delta_{10} = -8\alpha_t t_m l$

$X_1 = -\frac{\delta_{10}}{\delta_{11}} = 0,0089 \frac{EJ\alpha_t t_m}{l^2}$

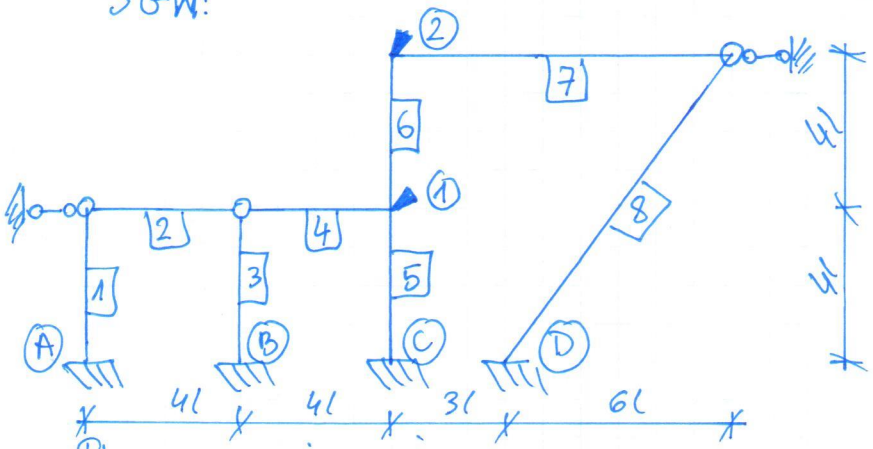
OPRACOWAŁA MARTA SITEK

Egzamin MKI 2013/2014 05.02.2014.

Zadanie 2

R. Cubacki

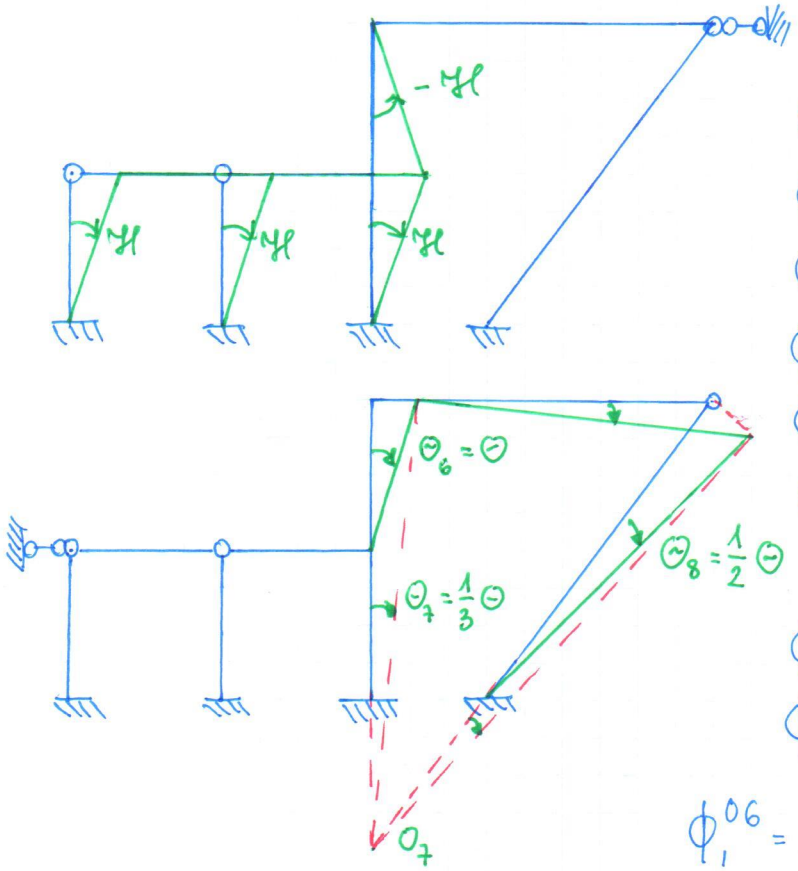
SGW:



wektor niewiadomych:

$$q = \begin{bmatrix} \varphi_1 \\ \varphi_2 \\ \psi \\ \Theta \end{bmatrix}$$

Plany przemieszczeń:



Wzory transformacyjne:

$$\phi_1^4 = \frac{3EJ}{4l}(\varphi_1)$$

$$\phi_1^5 = \frac{2EJ}{4l}(2\varphi_1 - 3\psi)$$

$$\phi_1^6 = \frac{2EJ}{4l}(2\varphi_1 + \varphi_2 - 3(\Theta - \psi)) + \phi_1^{0P}$$

$$\phi_2^6 = \frac{2EJ}{4l}(2\varphi_2 + \varphi_1 - 3(-\psi + \Theta)) + \phi_2^{0P}$$

$$\phi_2^7 = \frac{3EJ}{9l}(\varphi_2 - \frac{1}{3}\Theta)$$

$$\phi_A^1 = \frac{3EJ}{4l}(-\psi)$$

$$\phi_B^3 = \frac{3EJ}{4l}(-\psi)$$

$$\phi_C^5 = \frac{2EJ}{4l}(-3\psi + \varphi_1)$$

$$\phi_D^8 = \frac{3EJ}{10l}(-(\frac{1}{2}\Theta))$$

$$\phi_1^{0P} = -\frac{P(4l)}{8} \qquad \phi_2^{0P} = \frac{P(4l)}{8}$$

Układ równań:

1) $\phi_1^4 + \phi_1^5 + \phi_1^6 = 0$

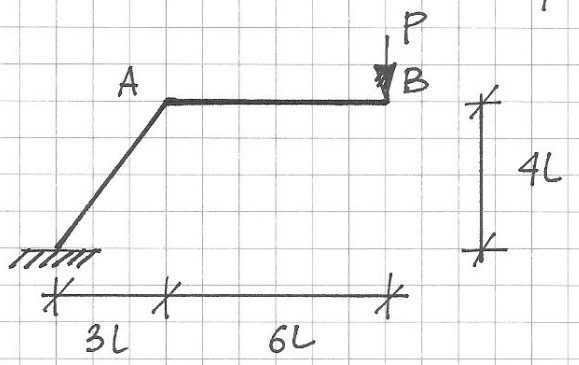
2) $\phi_2^6 + \phi_2^7 = 0$

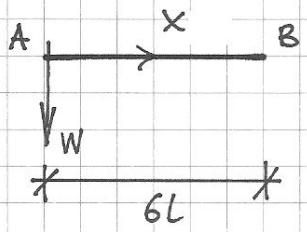
3) $\phi_A^1 \cdot \bar{\psi} + \phi_B^3 \cdot \bar{\psi} + (\phi_C^5 + \phi_1^5)\bar{\psi} + (\phi_2^6 + \phi_1^6)(-\bar{\psi}) + P \cdot 2l \cdot \bar{\psi} = 0$

4) $(\phi_1^6 + \phi_2^6)\bar{\Theta} + \phi_2^7 \cdot \frac{1}{3}\bar{\Theta} + \phi_D^8 \frac{1}{2}\bar{\Theta} + P \cdot 2l \cdot \bar{\Theta} = 0$

$$\frac{EJ}{L}\begin{bmatrix} 2.75 \; (\frac{11}{4}) & 0.5 & 0 & -1.5 \\ 0.5 & 1.3(3)\,(\frac{14}{11}) & 1.5 & -1.6(1)\,(\frac{29}{18}) \\ 0 & 1.5 & 7.5 & -3 \\ -1.5 & -1.6(1) & -3 & 3.112\,(\frac{3367}{1080}) \end{bmatrix} \cdot \begin{bmatrix} -0.5 \\ 0.5 \\ -2 \\ -2 \end{bmatrix} PL = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}$$

Egzamin MK1 5 II 2014, zadanie 3





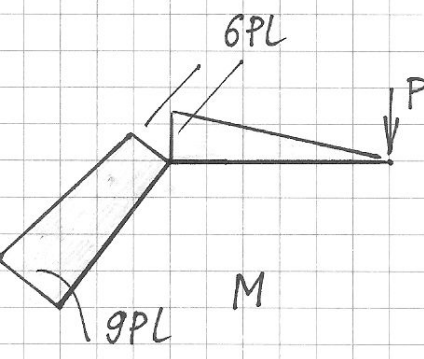
$$\xi = \frac{x}{6L} \qquad \xi \in [0,1]$$

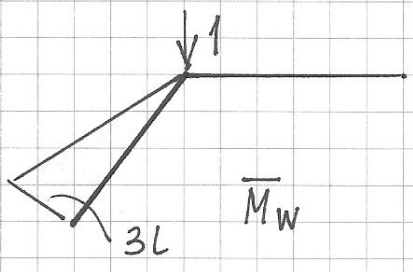
$$w^{IV}(\xi) = 0$$

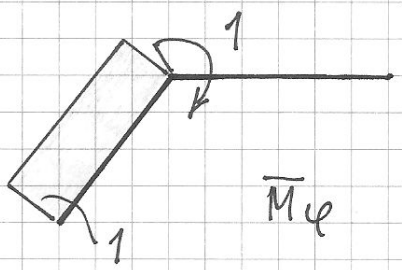
$$w(\xi) = C_0 + C_1\xi + C_2\xi^2 + C_3\xi^3$$

warunki brzegowe:

1) $w(0) = w_A$
2) $\varphi(0) = \varphi_A \rightarrow \frac{1}{6L} w'(0) = \varphi_A$
3) $M(1) = 0 \rightarrow -\frac{EJ}{(6L)^2} w''(1) = 0$
4) $T(1) = P \rightarrow -\frac{EJ}{(6L)^3} w'''(1) = P$







$$w_A = \int_S \overline{M}_W \varkappa \, ds = \int_S \frac{\overline{M}_W M}{EJ} ds = 60 \frac{PL^3}{EJ}$$

$$\varphi_A = \int_S \overline{M}_\varphi \varkappa \, ds = \int_S \frac{\overline{M}_\varphi M}{EJ} ds = \frac{75}{2} \frac{PL^2}{EJ}$$

1) $C_0 = 60 \frac{PL^3}{EJ}$
2) $\frac{1}{6L} C_1 = \frac{75}{2} \frac{PL^2}{EJ}$
3) $6C_3 + 2C_2 = 0$
4) $-\frac{EJ}{(6L)^3} \cdot 6C_3 = P$

$$\rightarrow \quad w(\xi) = \frac{PL^3}{EJ}\left(-36\xi^3 + 108\xi^2 + 225\xi + 60\right)$$