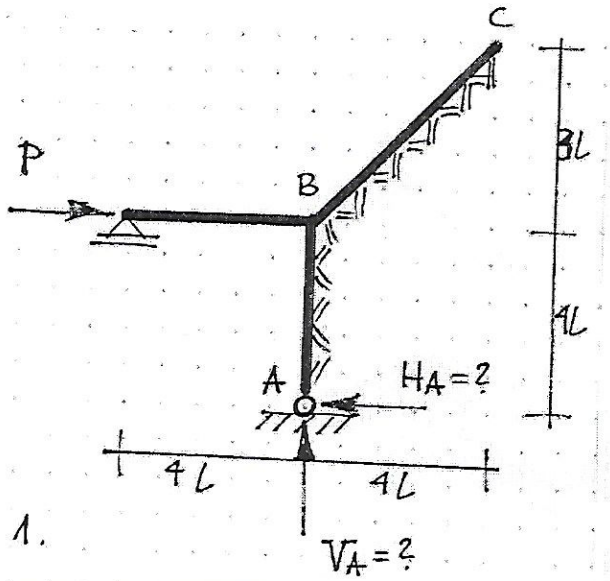
Egzamin z Mechaniki Konstrukcji (MK IPB), 6.02.2019
studia [redacted]stacjonarne

NAZWISKO, Imię				
rok akademicki zaliczenia ćwiczeń		nr albumu	grupa (IPB / BZ)	tryb studiów (ST / NST)
ocena zadania 1	ocena zadania 2	ocena zadania 3	ocena egzaminu	ocena łączna

Zadanie 1.

$EJ = const.$, $\quad k = 0{,}0324\dfrac{EJ}{l^4}$

Oblicz reakcje H_A, V_A w podporze A w ramie z rys. 1.
Rama jest podparta sprężyście na odcinkach A-B oraz B-C.

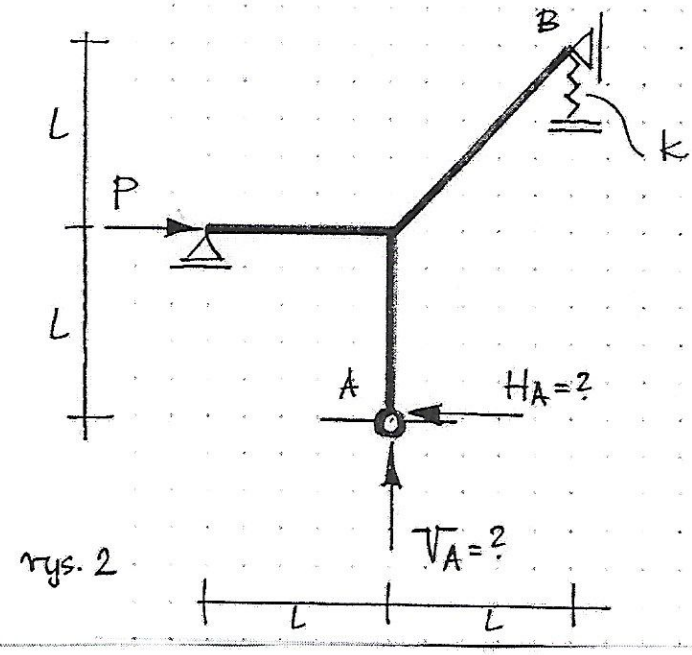


rys. 1.

Zadanie 2.

$EJ = const.$, $\quad k = 4\dfrac{EJ}{l^3}$

Oblicz reakcje H_A, V_A w podporze A w ramie z rys. 2

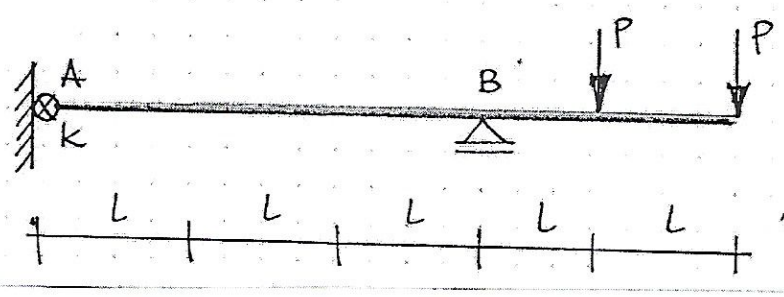


rys. 2

Zadanie 3.

$EJ = const.$, $\quad k = 10\dfrac{EJ}{l}$

Wyznacz linię ugięcia odcinka A-B belki z rys. 3.

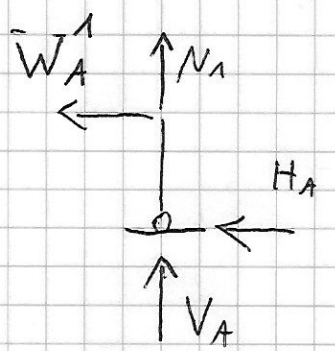


rys.3

Egzemin 2 MK 3

zadanie 1

Siły działające w węźle A:

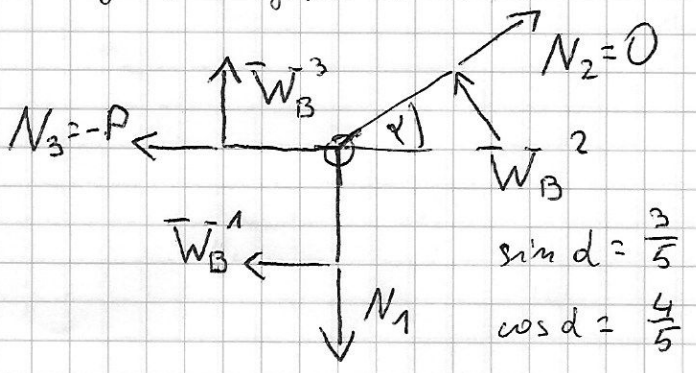


$V_A = -N_1$

$H_A = -\bar{W}_A^1$

V G W

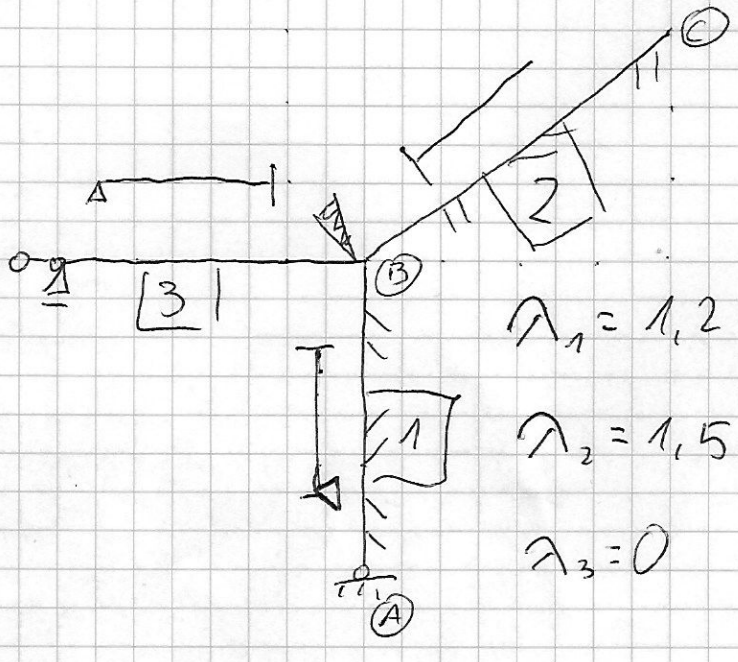
Siły działające w węźle B:



$N_1 = \bar{W}_B^3 + \bar{W}_B^2 \cdot \cos\alpha$

$V_A = -\bar{W}_B^3 - \bar{W}_B^2 \cdot \frac{4}{5}$

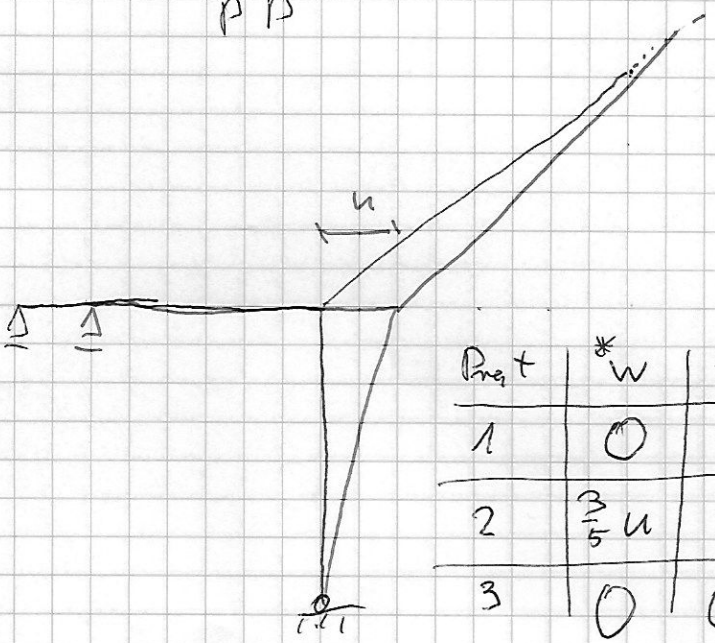
P P



$\lambda_1 = 1,2$

$\lambda_2 = 1,5$

$\lambda_3 = 0$



Pręt	*w	w*
1	0	u
2	$\frac{3}{5}u$	0
3	0	0

RR:

$$\begin{cases} \bar{\Phi}_B^1 + \bar{\Phi}_B^2 + \bar{\Phi}_B^3 = 0 \\ -\left[\bar{W}_B^1 \bar{u} + \bar{W}_B^2 \cdot \frac{3}{5}\bar{u}\right] + P\bar{u} = 0 \end{cases}$$

$$\frac{EJ}{l}\begin{bmatrix} 2,073 & -0,123 \\ -0,123 & 0,144 \end{bmatrix}\begin{bmatrix} \varphi_B \\ \frac{u}{l} \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \end{bmatrix} Pl$$

$\bar{W}_A^1 = -0,143P$

$\bar{W}_B^2 = 0,511P \Rightarrow$

$\bar{W}_B^3 = 0,081P$

$V_A = -0,4898P$

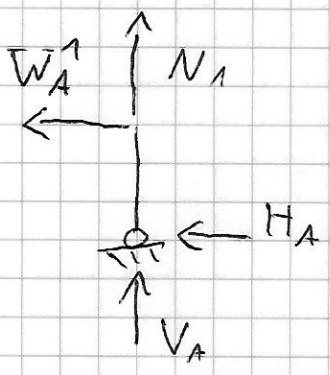
$H_A = 0,143P$

$\varphi_B = 0,433 \frac{Pl^2}{EJ}$

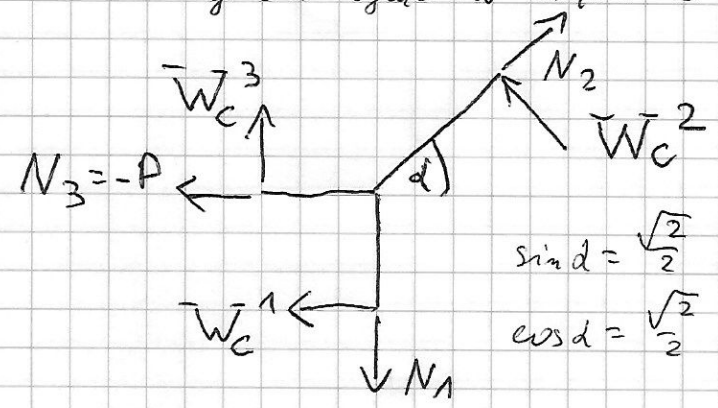
$u = 7,233 \frac{Pl^2}{EJ}$

Egzamin 2 MK 3 zadanie 2

Siły działające w węźle A:



Siły działające w węźle C:



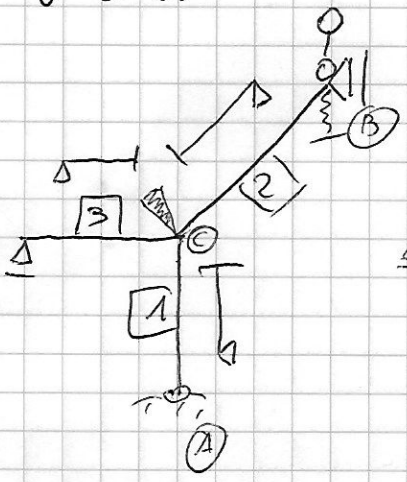
$V_A = -N_1$

$H_A = -\bar{W}_A^1$

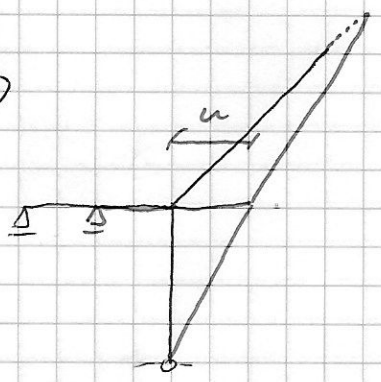
$$N_1 = \bar{W}_C^1 + W_C^3 - P + \sqrt{2}\,\bar{W}_C^2$$

$$V_A = -\bar{W}_C^1 - \bar{W}_C^3 + P - \sqrt{2}\,\bar{W}_C^2$$

UGW



PP



P_{rot}	$^*w$	w^*
1	0	u
2	$\frac{\sqrt{2}}{2}u$	$-\frac{\sqrt{2}}{2}u$
3	0	0

$\Delta w = u$

$Q_w = ku = 4\frac{EJ}{l^2}\frac{u}{l}$

RR:

$$\begin{cases} \underline{\Phi}_C^1 + \underline{\Phi}_C^2 + \underline{\Phi}_C^3 = 0 \\ -\left[\bar{W}_C^1 \bar{u} + \bar{W}_C^2 \frac{\sqrt{2}}{2}\bar{u} + \bar{W}_{13}^2\left(-\frac{\sqrt{2}}{2}\bar{u}\right)\right] + P\bar{u} - Q_w\bar{u} = 0 \end{cases}$$

$$\frac{EJ}{l}\begin{bmatrix} 8{,}121 & -0{,}879 \\ -0{,}879 & 9{,}121 \end{bmatrix}\begin{bmatrix} \varphi_C \\ \frac{u}{l} \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \end{bmatrix} Pl \Rightarrow \varphi_C = 0{,}012\frac{Pl^2}{EJ}, \quad \frac{u}{l} = 0{,}110\frac{Pl^2}{EJ}$$

$\bar{W}_C^1 = 0{,}296\,P$

$\bar{W}_A^1 = -0{,}296\,P$

$\bar{W}_C^2 = 0{,}184\,P$

$\bar{W}_C^3 = 0{,}036\,P$

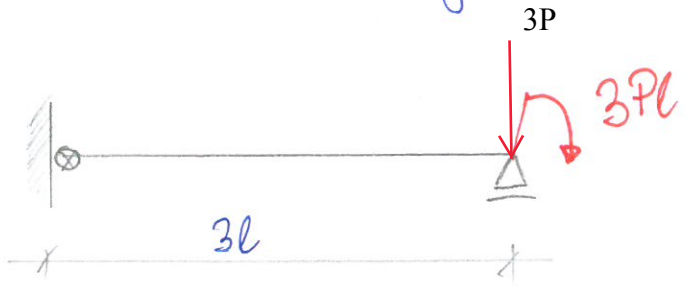
$H_A = 0{,}296\,P$

$\Rightarrow$

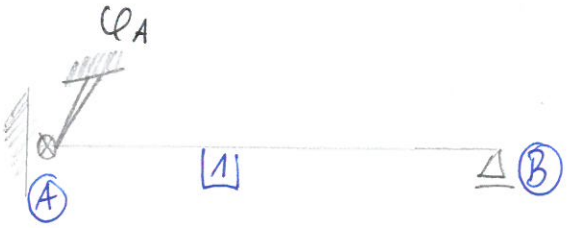
$V_A = 0{,}407\,P$

ZADANIE 3 EGZAMIN IPB

Schemat zredukowany



Schemat zastępczy



Równanie równowagi

$$\Phi_A^{(1)} + Q_\varphi = 0$$

Wzory transformacyjne i relacja konstytutywna dla węzła

$$\Phi_A^{\uparrow} = \frac{EJ}{3l}\left[3\varphi_A\right] + \frac{3Pl}{2}$$

$$Q_\varphi = k \cdot \Delta\varphi = k\varphi_A = 10\frac{EJ}{l}\varphi_A$$

$$11\frac{EJ}{l}\varphi_A + \frac{3}{2}Pl = 0 \quad \Rightarrow \quad \varphi_A = -\frac{3}{22}\frac{Pl^2}{EJ}$$

Linia ugięcia AB

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

Warunki brzegowe

$$w(0) = 0 \qquad w(3l) = 0$$

$$\frac{dw}{dx}(0) = \varphi_A \qquad M(3l) = -EJ\frac{d^2w}{dx^2}(3l) = -3Pl$$

$$w(x) = -\frac{3Pl^2}{22EJ}x - \frac{15Pl}{22EJ}x^2 + \frac{8P}{33EJ}x^3$$