Egzamin z Mechaniki Konstrukcji (MK3 IPB), 8.09.2019
studia niestacjonarne

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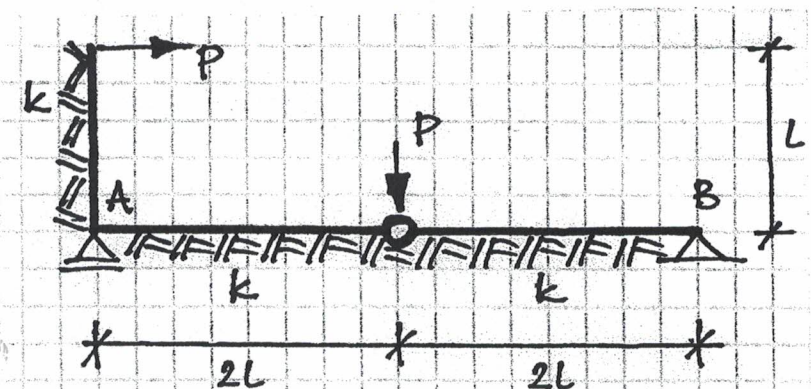
nr albumu	grupa (IPB / BZ)	tryb studiów (ST / NST)

ocena zadania 1	ocena zadania 2	ocena zadania 3	ocena egzaminu pisemnego

Zadanie 1.

Oblicz poziome i pionowe składowe reakcji podpór A (podpora przesuwna) i B (podpora nieprzesuwna) ramy z rys.1.

$$EJ = \text{const.}\ ,\ k = 0{,}9604\frac{EJ}{l^4}\ .$$

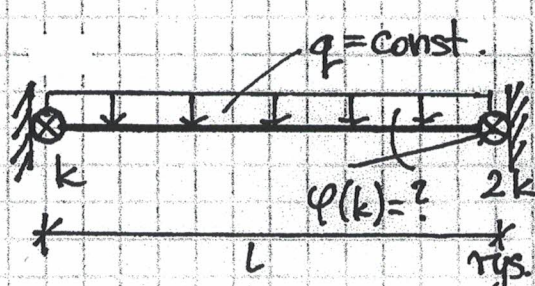


rys. 1

Zadanie 2.

Oblicz wartość $\varphi(k)$ w ramie z rys. 2
dla $k = \frac{EJ}{l}, k = 5\frac{EJ}{l}, k = 20\frac{EJ}{l}, k = +\infty$.

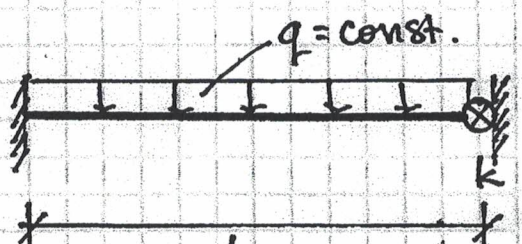
Uwaga: Podpory mają różne współczynniki sprężystości ze względu na obrót.



rys. 2

Zadanie 3.

Wyprowadź równanie linii ugięcia belki z rys. 3.

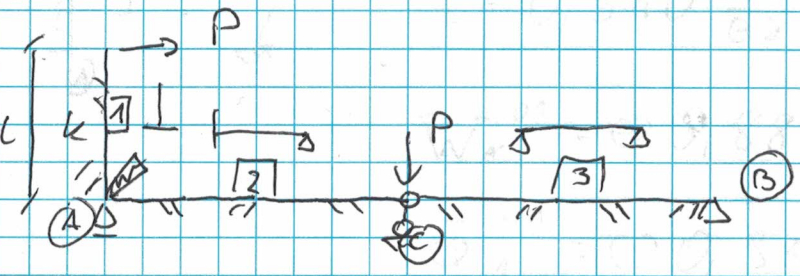


rys. 3

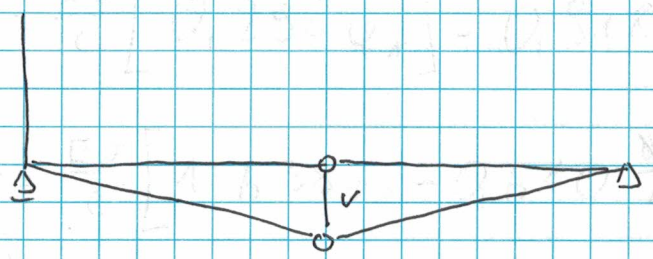
Egzamin 2 MK 3 IPB 08.09.2019 r.

Zadanie 1

$$q_1 = \begin{bmatrix} \varphi_A \\ \frac{v}{l} \end{bmatrix}$$



PP



Przęt	*w	w*	u	λ
1	0	0	0	0,7
2	0	V	0	1,4
3	V	0	0	1,4

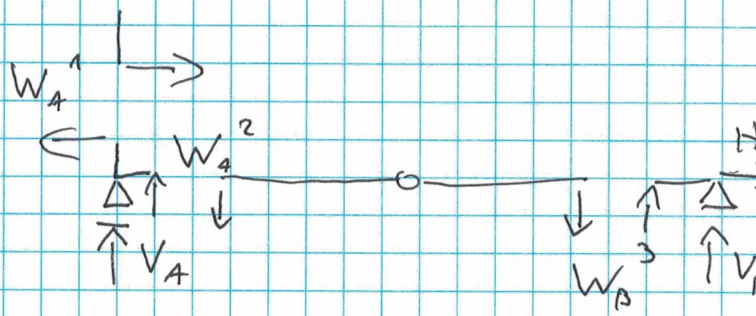
RR.

$$\begin{cases} \bar{\varphi}_A^1 + \bar{\varphi}_A^2 = 0 \\ \ominus(\bar{W}_C^2 \bar{v} + \bar{W}_C^3 \bar{v}) + P\bar{v} = 0 \end{cases}$$

$$\frac{EJ}{l} \begin{bmatrix} 1,936 & -0,610 \\ -0,610 & 1,399 \end{bmatrix} \begin{bmatrix} \varphi_A \\ \frac{v}{l} \end{bmatrix} = \begin{bmatrix} 0,918 \\ 1 \end{bmatrix} Pl$$

$$\varphi_A = 0,810 \frac{Pl^2}{EJ}$$

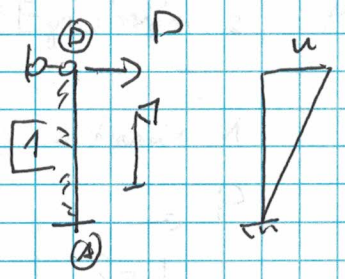
$$\frac{v}{l} = 1,068 \frac{Pl^2}{EJ}$$



$$V_A = \ominus W_A^2 = \ominus 0,726\,P$$

$$V_B = \ominus W_B^3 = \ominus 0,286\,P$$

$$H_B = \ominus W_A^1 = 0,525\,P$$



$$-(\bar{W}_D^{01} \bar{u}) + P\bar{u} = 0$$

$$\frac{u}{l} = 0,310 \frac{Pl^2}{EJ}$$

$$\bar{W}_A^{01} = \ominus 0,889 P$$

$$\bar{\Phi}_A^{01} = \ominus 0,918 Pl$$

$$\bar{\Phi}_A^1 = \frac{EJ}{l}\left[0,298\,\varphi_A\right] - 0,918 Pl$$

$$\bar{\Phi}_A^2 = \frac{EJ}{l}\left[1,638\,\varphi_A - 0,610 \frac{W}{l}\right]$$

$$\bar{W}_C^2 = \frac{EJ}{l^2}\left[\ominus 0,610\,\varphi_A + 0,813 \frac{W}{l}\right]$$

$$\bar{W}_C^3 = \frac{EJ}{l^2}\left[0,586 \frac{W}{l}\right]$$

$$\bar{W}_A^1 = \frac{EJ}{l^2}\left[0,449\,\varphi_A\right] \ominus 0,889 P$$

$$\bar{W}_A^2 = \frac{EJ}{l^2}\left[1,054\,\varphi_A \ominus 0,178 \frac{W}{l}\right]$$

$$\bar{W}_B^3 = \frac{EJ}{l^2}\left[\ominus 0,268 \frac{V}{l}\right]$$

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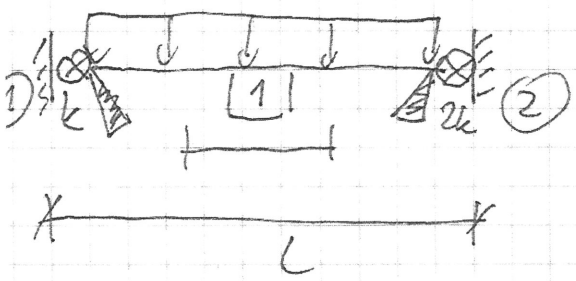
Zadanie 2



$$q_1 = \begin{Bmatrix} u_1 \\ u_2 \end{Bmatrix}$$

$$Q_1 = u_1 k$$

$$Q_2 = \ominus u_2 \cdot 2k$$

RR:

$$\underline{\Phi}_1^1 + Q_1 = 0$$

$$\underline{\Phi}_2^1 \bigcirc\!\!\!\!\bigcirc Q_2 = 0$$

$$\underline{\Phi}_1^1 = \frac{EJ}{L}\left[4u_1 + 2u_2\right] \ominus \frac{1}{12} qL^2$$

$$\underline{\Phi}_2^1 = \frac{EJ}{L}\left[2u_1 + 4u_2\right] + \frac{1}{12} qL^2$$

$$\frac{EJ}{L}\begin{bmatrix} 4+k & 2 \\ 2 & 4+2k \end{bmatrix}\begin{bmatrix} u_1 \\ u_2 \end{bmatrix} = \begin{bmatrix} \frac{1}{12} \\ \ominus \frac{1}{12} \end{bmatrix} qL^2$$

$$\varphi(k) = u_2 = \ominus \frac{6+k}{24(6+6k+k^2)} \frac{qL^3}{EJ}$$

$$\varphi\left(\frac{EJ}{L}\right) = \ominus \frac{7}{312} \frac{qL^3}{EJ}$$

$$\varphi\left(5\frac{EJ}{L}\right) = \ominus \frac{11}{1464} \frac{qL^3}{EJ}$$

$$\varphi\left(20\frac{EJ}{L}\right) = \ominus \frac{13}{6312} \frac{qL^3}{EJ}$$

$$\varphi(\infty) = 0$$