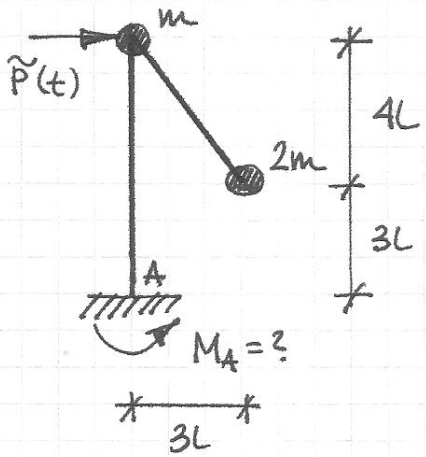
Kolokwium 2.2 b r.ak. 2015/2016

Obliczyć amplitudę momentu w utwierdzeniu.



$\tilde{P}(t) = P\sin(\theta t)$

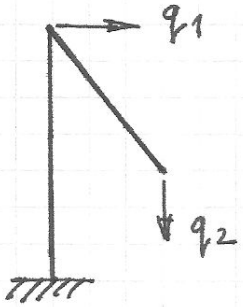
$\theta^2 = \frac{EJ}{mL^3}$

$EJ = \text{const.}$

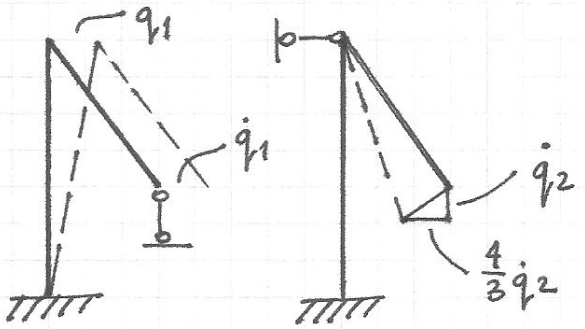
$q(t) = a \sin(\theta t)$

$a = \begin{bmatrix} a_1 \\ a_2 \end{bmatrix}$ - wektor amplitud

Współrzędne Lagrange'a



Plany prędkości



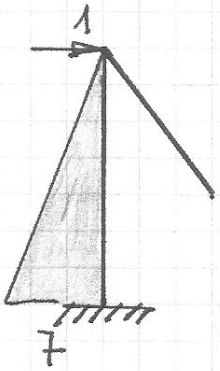
Równanie ruchu: $(\mathbb{I} - \theta^2 \mathbb{D}\mathbb{M})a = \mathbb{D}_0 P$

$$\mathbb{I} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

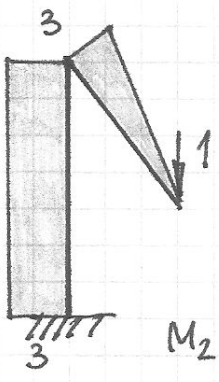
Energia kinetyczna: $2E_K = \dot{q}^T M \dot{q} =$

$m\dot{q}_1^2 + 2m\left[\left(\dot{q}_1 - \frac{4}{3}\dot{q}_2\right)^2 + \dot{q}_2^2\right]$

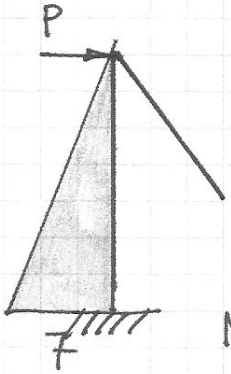
$$\mathbb{M} = m\begin{bmatrix} 3 & -\frac{8}{3} \\ -\frac{8}{3} & \frac{50}{9} \end{bmatrix}$$



$M_1[L]$



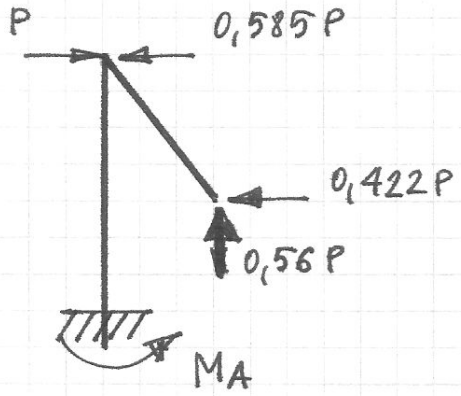
$M_2[L]$



$M_0[PL]$

$$\mathbb{D} = \begin{bmatrix} 114{,}33 & 73{,}5 \\ 73{,}5 & 78 \end{bmatrix} \frac{L^3}{EJ} \qquad \mathbb{D}_0 P = \begin{bmatrix} 114{,}33 \\ 73{,}5 \end{bmatrix} \frac{PL^3}{EJ}$$

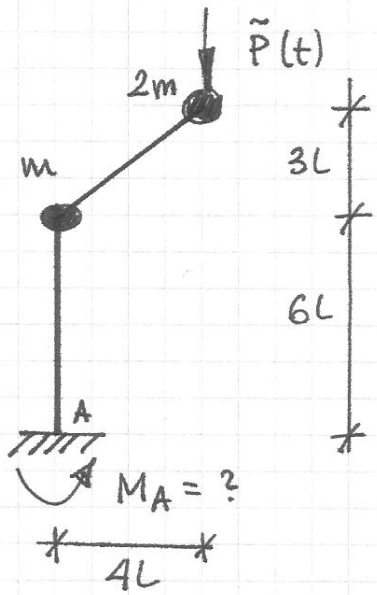
$$\left(\mathbb{I} - \theta^2 \mathbb{D}\mathbb{M}\right) a = \mathbb{D}_0 P \rightarrow \begin{aligned} a_1 &= -0{,}585 \ \frac{PL^3}{EJ} \\ a_2 &= -0{,}128 \ \frac{PL^3}{EJ} \end{aligned}$$



$$M_A = -0{,}04\, PL$$

Kolokwium 2.2a r. ak. 2015/2016

Obliczyć amplitudę momentu w utwierdzeniu.

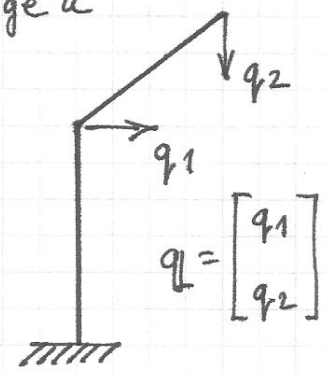


$EJ = \text{const.}$

$\tilde{P}(t) = P\sin(\theta t)$

$\theta^2 = \frac{EJ}{mL^3}$

Współrzędne Lagrange'a



$q(t) = a\sin(\theta t) \qquad a = \begin{bmatrix} a_1 \\ a_2 \end{bmatrix} \qquad q = \begin{bmatrix} q_1 \\ q_2 \end{bmatrix}$

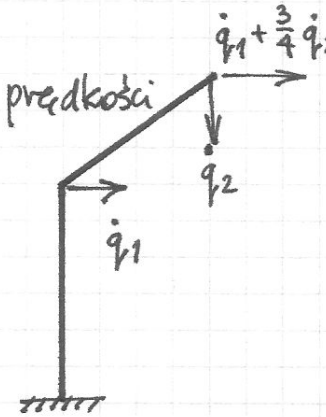
a - wektor amplitud

Równanie ruchu:

$$\left(\mathbb{I} - \theta^2 \mathbb{D}\mathbb{M}\right) a = \mathbb{D}_0 P$$

$$\mathbb{I} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

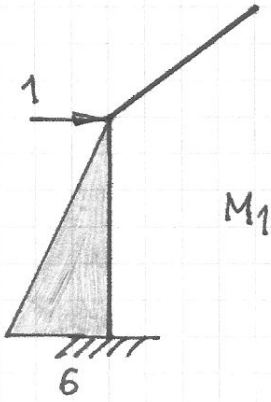
Plan prędkości



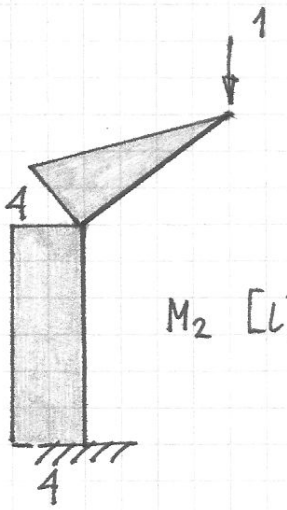
Energia kinetyczna

$$2E_K = \dot{q}^T M \dot{q} = m\dot{q}_1^2 + 2m\left[\left(\dot{q}_1 + \tfrac{3}{4}\dot{q}_2\right)^2 + \dot{q}_2^2\right]$$

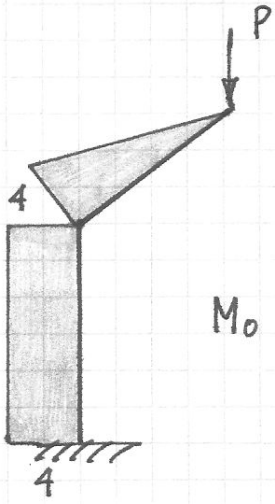
$$\mathbb{M} = m \begin{bmatrix} 3 & \frac{3}{2} \\ \frac{3}{2} & \frac{25}{8} \end{bmatrix}$$



M_1 [L]



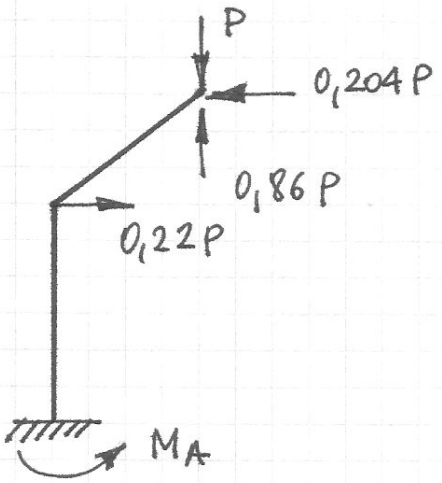
M_2 [L]



M_0 [PL]

$$\mathbb{D} = \frac{L^3}{EJ} \begin{bmatrix} 72 & 72 \\ 72 & 122{,}67 \end{bmatrix} \qquad \mathbb{D}_0 P = \begin{bmatrix} 72 \\ 122{,}67 \end{bmatrix} \frac{PL^3}{EJ}$$

$$(\mathbb{I} - \theta^2 \mathbb{D}\mathbb{M})\, a = \mathbb{D}_0 P \rightarrow \begin{aligned} a_1 &= 0{,}22 \frac{PL^3}{EJ} \\ a_2 &= -0{,}43 \frac{PL^3}{EJ} \end{aligned}$$



$$M_A = 0{,}044\, PL$$