

PŘÍKLAD HB-01

D: $\alpha, \beta, \gamma, \delta, \epsilon$

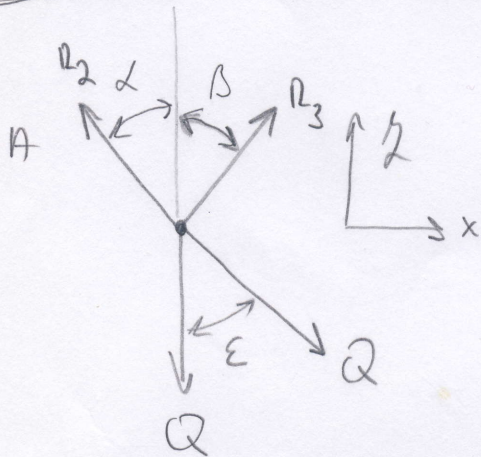
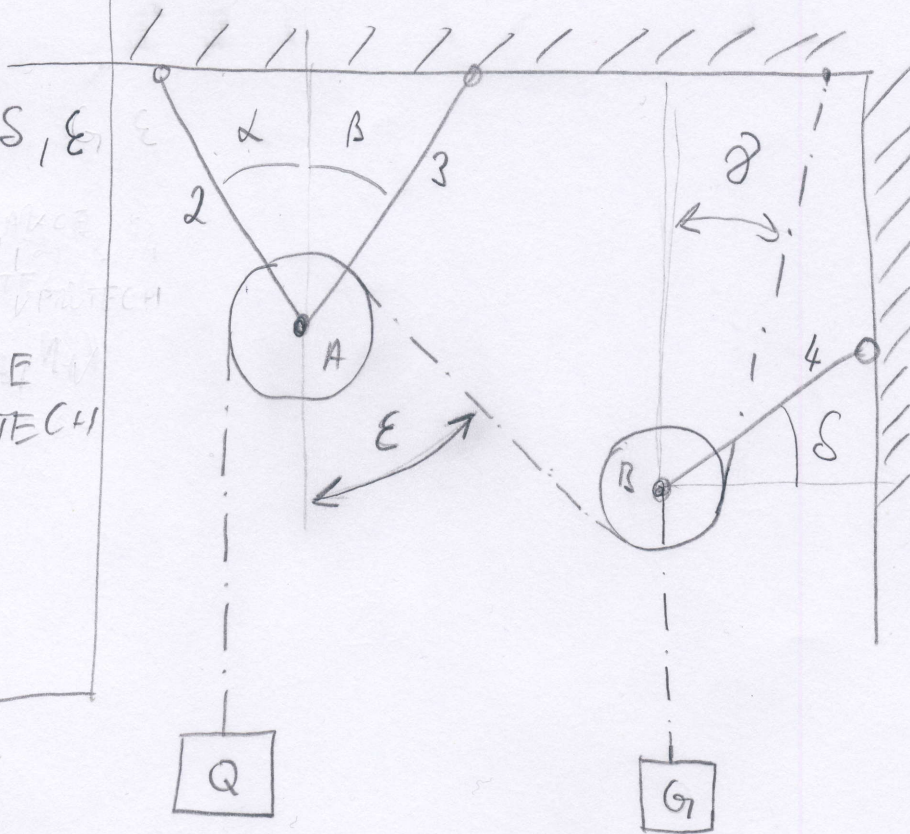
U: a) G

b) Q

U: REAKCE
V PRŮTĚCH

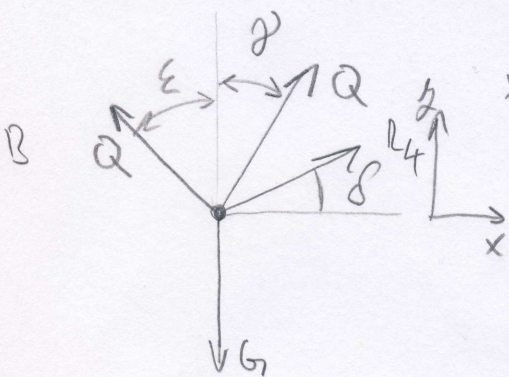
a) Q

b) G



$$x: Q \sin \epsilon + R_3 \sin \beta - R_2 \sin \alpha = 0 \quad 1)$$

$$z: R_3 \cos \beta + R_2 \cos \alpha - Q - Q \cos \epsilon = 0 \quad 2)$$



$$x: Q \sin \gamma - Q \sin \epsilon + R_4 \cos \delta = 0 \quad 3)$$

$$z: Q \cos \gamma + Q \cos \epsilon + R_4 \sin \delta - G = 0 \quad 4)$$

4 NEZMĚNĚ : Q, R_2, R_3, R_4
4 ROVNICE

$$\begin{array}{c}
 \text{a)} \\
 \begin{array}{|c|c|c|c|}
 \hline
 R_2 & R_3 & R_4 & Q \\
 \hline
 -\sin \alpha & \sin \beta & 0 & \sin \epsilon \\
 \hline
 \cos \alpha & \cos \beta & 0 & -1 - \cos \epsilon \\
 \hline
 0 & 0 & \cos \delta & \sin \gamma - \sin \epsilon \\
 \hline
 0 & 0 & \sin \delta & \cos \gamma + \cos \epsilon \\
 \hline
 \end{array}
 \end{array}
 \times
 \begin{array}{|c|}
 \hline
 R_2 \\
 \hline
 R_3 \\
 \hline
 R_4 \\
 \hline
 Q \\
 \hline
 \end{array}
 =
 \begin{array}{|c|}
 \hline
 0 \\
 \hline
 0 \\
 \hline
 0 \\
 \hline
 G_7 \\
 \hline
 \end{array}
 \Rightarrow R_2, R_3, R_4, Q$$

MATLAB / EXCEL...

$$R_4 = \frac{Q \sin \epsilon - Q \sin \gamma}{\cos \delta}$$

$$R_4 = \frac{G_7 - Q \cos \epsilon - Q \cos \gamma}{\sin \delta}$$

$$\frac{Q \sin \epsilon - Q \sin \gamma}{\cos \delta} = \frac{G_7 - Q \cos \epsilon - Q \cos \gamma}{\sin \delta}$$

$$\frac{G_7 - Q \cos \epsilon - Q \cos \gamma}{Q \sin \epsilon - Q \sin \gamma} = \tan \delta$$

$$G_7 - Q(\cos \epsilon + \cos \gamma) = Q(\sin \epsilon - \sin \gamma) \tan \delta$$

$$G_7 = Q[(\sin \epsilon - \sin \gamma) \tan \delta + (\cos \epsilon + \cos \gamma)]$$

$$Q = \frac{G_7}{(\sin \epsilon - \sin \gamma) \tan \delta + (\cos \epsilon + \cos \gamma)}$$

$$\begin{array}{l}
 1) R_3 \sin \beta - R_2 \sin \alpha = -Q \sin \epsilon \\
 2) R_3 \cos \beta + R_2 \cos \alpha = Q(1 + \cos \epsilon)
 \end{array}
 \Rightarrow
 \begin{array}{l}
 R_3 = \frac{R_2 \sin \alpha - Q \sin \epsilon}{\sin \beta} \\
 R_3 = \frac{Q(1 + \cos \epsilon) - R_2 \cos \alpha}{\cos \beta}
 \end{array}$$

$$\frac{R_2 \sin \alpha - Q \sin \epsilon}{\sin \beta} = \frac{Q(1 - \cos \epsilon) - R_2 \cos \alpha}{\cos \beta}$$

$$R_2 \sin \alpha - Q \sin \epsilon = [Q(1 - \cos \epsilon) - R_2 \cos \alpha] \tan \beta$$

$$R_2 \sin \alpha + R_2 \cos \alpha \tan \beta = Q(1 - \cos \epsilon) \tan \beta + Q \sin \epsilon$$

$$R_2 = \frac{(1 - \cos \epsilon) \tan \beta + \sin \epsilon}{\sin \alpha + \cos \alpha \tan \beta} Q$$

$$R_3 = \frac{R_2 \sin \alpha - Q \sin \epsilon}{\cos \beta}$$

$$R_4 = \frac{\sin \epsilon - \sin \beta}{\cos \beta} Q$$

b) PRO ZADANÉ Q A MEZNAHE G:

ROVNICE ROVNOVÁHY STĚŽNĚ, JEN JINĚ TUKA MATICE

R_2	R_3	R_4	G		
$-\sin \alpha$	$\sin \beta$	0	0	\times	$= Q \cdot$
$\cos \alpha$	$\cos \beta$	0	0		
0	0	$\cos \delta$	0		
0	0	$\cos \delta$	-1		

$$\begin{bmatrix} -\sin \epsilon \\ 1 + \cos \epsilon \\ -\sin \beta + \sin \epsilon \\ -\cos \beta - \cos \epsilon \end{bmatrix}$$