$\gamma = \det(C)$ — матрицы СЛАУ

$\delta =$

$\begin{pmatrix} \delta_1 \\ \delta_2 \end{pmatrix} =$

$D_1 = \dfrac{D_1}{\gamma} = \dfrac{3\cdot10^{-2}\theta^2 - 1,4\cdot10^{-7}\theta^4}{-1 + 0,0013852\,\theta^2 - 1,826\cdot10^{-9}\theta^4}$

$D_2 = \dfrac{D_2}{\gamma} = \dfrac{-4\cdot10^{-6}\theta^2 + 4,75\cdot10^{-12}\theta^4}{-1 + 0,0013852\,\theta^2 - 1,826\cdot10^{-9}\theta^4}$

$W_1 = \dfrac{1}{\sqrt{\dfrac{m_1\delta_{11} + m_2\delta_{22}}{2} + \sqrt{\left(\dfrac{m_1\delta_{11} - m_2\delta_{22}}{2}\right)^2 + m_1 m_2 \delta_{12}\delta_{22}}}}$, $\begin{vmatrix} m_1 = 15,2 \\ m_2 = 29,6 \\ \delta_{11} \\ \delta_{22} \\ \delta_{12} \end{vmatrix} =$

$= 127,489 \ \text{рад}/c$

$W_2 = \dfrac{1}{\sqrt{\dfrac{m_1\delta_{11} + m_2\delta_{22}}{2} - \sqrt{\left(\dfrac{m_1\delta_{11} - m_2\delta_{22}}{2}\right)^2 + m_1 m_2 \delta_{12}\delta_{21}}}} = 1127,826\,\dfrac{\text{рад}}{c}$

$\Pi_1 = \dfrac{60\,W_1}{2\pi} = 1213\,\dfrac{\text{об}}{\text{мин}}$; $\Pi_2 = \dfrac{60\,W_2}{2\pi} = 10772\,\text{об}/\text{мин}$

Первая форма колебаний:

$\theta = W_1 = 127,489\ \text{рад}/\text{сек}$

$D_{\text{I}} = \begin{pmatrix} D_1 \big| W_1 \\ D_2 \big| W_1 \end{pmatrix} = \begin{pmatrix} 0,0187 \\ -0,00303 \end{pmatrix} \begin{pmatrix} 0,0187 \\ -0,0022 \end{pmatrix}$

Вторая форма колебаний:

$\theta = W_2 = 1127,826\ \text{рад}/\text{сек}$

$D_{\text{II}} = \begin{pmatrix} D_1 \big| W_2 \\ D_2 \big| W_2 \end{pmatrix} = \begin{pmatrix} 0,00573 \\ -0,00303 \end{pmatrix}$

Проверка на ортогональность:

$(A\,D_{\text{I}})^T \cdot D_{\text{II}} = 0$; $A = \begin{pmatrix} m_1 & 0 \\ 0 & m_2 \end{pmatrix}$ $(A\,D_{\text{I}})^T = (0,284; -0,064)$

$(A\cdot D_{\text{I}})^T \cdot D_{\text{II}} = (0,284; -0,064)\begin{pmatrix} 0,00573 \\ -0,00303 \end{pmatrix} = 0,0018$

$\delta = \dfrac{0,0018}{0,284}\cdot100\% = 0,6\% < 3\%$

Расчёт центробежной силы: $P_1 = m_1\theta^2\varepsilon_1$ $P_2 = m_2\theta^2\varepsilon_2$

$\Pi_0 = 200\ \text{об}/\text{мин} \Rightarrow \theta = \dfrac{2\pi\Pi_0}{60} = 20,93\ \text{рад}/\text{сек}$

$D_1\big|\theta = 20,93 = (-0,0032)\ (0,0045)$ $D_2\big|\theta = 20,93 = 0,0045$

$P_1 = 15,2\cdot20,93^2\cdot2,5\cdot10^{-3} = 16,65\,H$

$P_2 = 29,6\cdot20,93^2\cdot3\cdot10^{-3} = 38,91\,H$