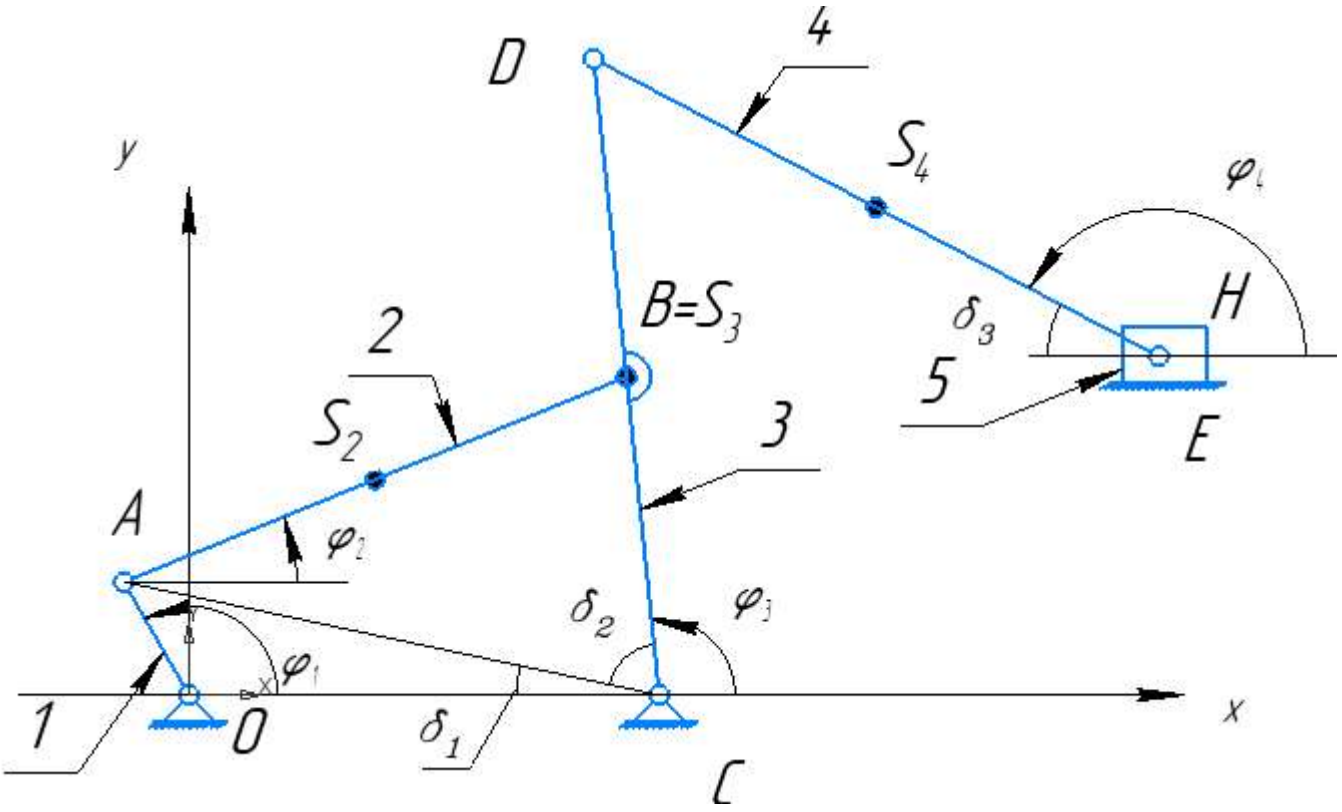


Дано:

$l_{OA} := 0.347$ $l_{AS2} := 0.7225$ $l_{S2B} := 0.723$ $f := 99.1deg$ $l_{DH} := 1.7$

$l_{AB} := 1.445$ $l_{DS4} := 0.85$ $Y_H := 0.9$ $l_{S4H} := 0.85$ $X_C := 1.25$

$l_{BC} := 0.85$ $l_{CD} := 1.7$ $\varphi_0 := 219.1deg$ $Y_C := 0$

Составление расчетной схемы:

$\varphi_1(\varphi) := \varphi_0 - \varphi$

$X_A(\varphi) := l_{OA} \cdot \cos(\varphi_1(\varphi))$

$Y_A(\varphi) := l_{OA} \cdot \sin(\varphi_1(\varphi))$

$$l_{AC}(\varphi) := \sqrt{(l_{OA})^2 + X_C^2 - 2 \cdot X_C \cdot l_{OA} \cdot \cos(\varphi_1(\varphi))}$$

$$\delta_1(\varphi) := \operatorname{asin}\left(\frac{l_{OA} \cdot \sin(\varphi_1(\varphi))}{l_{AC}(\varphi)}\right)$$

$$\delta_2(\varphi) := \operatorname{acos}\left[\frac{\left(l_{AC}(\varphi)^2 + l_{BC}^2 - l_{AB}^2\right)}{2 l_{AC}(\varphi) \cdot l_{BC}}\right]$$

$\varphi_3(\varphi) := \pi - \delta_1(\varphi) - \delta_2(\varphi)$

$X_B(\varphi) := l_{BC} \cdot \cos(\varphi_3(\varphi)) + X_C$

$X_O(\varphi) := 0$

$Y_O(\varphi) := 0$

$\varphi_1(f) = 120 \cdot deg$

$X_A(f) = -0.174$

$Y_A(f) = 0.301$

$l_{AC}(f) = 1.455$

$\delta_1(f) = 11.921 \cdot deg$

$\delta_2(f) = 72.32 \cdot deg$

$\varphi_3(f) = 95.759 \cdot deg$

$X_B(f) = 1.165$

$$Y_B(\varphi) := l_{BC}\cdot\sin\left(\varphi_3(\varphi)\right) \qquad Y_B(f) = 0.846$$

$$\varphi_2(\varphi) := \operatorname{atan}\left(\frac{Y_B(\varphi) - Y_A(\varphi)}{X_B(\varphi) - X_A(\varphi)}\right) \qquad \varphi_2(f) = 22.167\cdot\text{deg}$$

$$X_{S2}(\varphi) := X_A(\varphi) + l_{AS2}\cdot\cos\left(\varphi_2(\varphi)\right) \qquad X_{S2}(f) = 0.496$$

$$Y_{S2}(\varphi) := Y_A(\varphi) + l_{AS2}\cdot\sin\left(\varphi_2(\varphi)\right) \qquad Y_{S2}(f) = 0.573$$

$$Y_D(\varphi) := l_{CD}\cdot\sin\left(\varphi_3(\varphi)\right) \qquad Y_D(f) = 1.691$$

$$X_D(\varphi) := l_{CD}\cdot\cos\left(\varphi_3(\varphi)\right) + X_C \qquad X_D(f) = 1.079$$

$$\delta_3(\varphi) := \operatorname{asin}\left(\frac{Y_D(\varphi) - Y_H}{l_{DH}}\right) \qquad \delta_3(f) = 27.745\cdot\text{deg}$$

$$X_H(\varphi) := l_{DH}\cdot\cos\left(\delta_3(\varphi)\right) + X_D(\varphi) \qquad X_H(f) = 2.584$$

$$\varphi_4(\varphi) := \pi - \delta_3(\varphi) \qquad \varphi_4(f) = 152.255\cdot\text{deg}$$

$$X_{S4}(\varphi) := X_H(\varphi) + l_{DS4}\cdot\cos\left(\varphi_4(\varphi)\right) \qquad X_{S4}(f) = 1.832$$

$$Y_{S4}(\varphi) := Y_H + l_{DS4}\cdot\sin\left(\varphi_4(\varphi)\right) \qquad Y_{S4}(f) = 1.296$$

$$X_{S3}(\varphi) := X_B(\varphi) \qquad X_{S3}(f) = 1.165$$

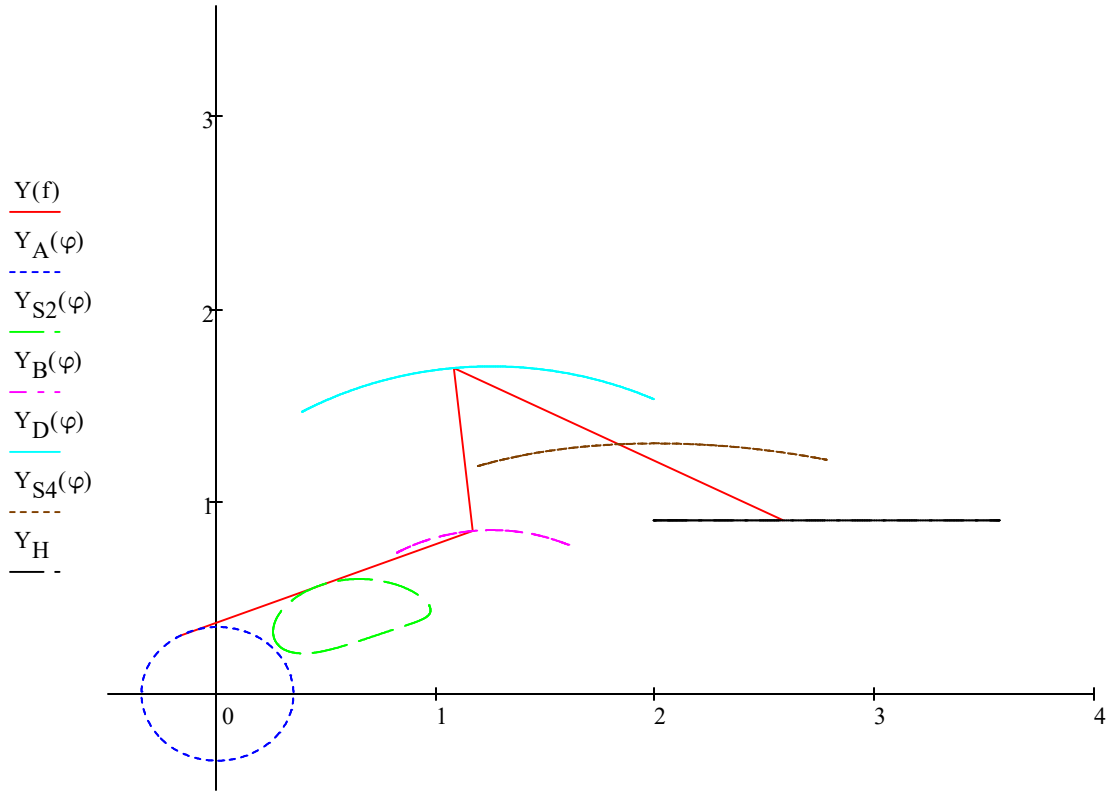
$$Y_{S3}(\varphi) := Y_B(\varphi) \qquad Y_{S3}(f) = 0.846$$

Построение проверочной схемы:

$$X(\varphi) := \left(X_A(\varphi)\ \ X_{S2}(\varphi)\ \ X_B(\varphi)\ \ X_D(\varphi)\ \ X_{S4}(\varphi)\ \ X_H(\varphi)\right)^T$$

$$Y(\varphi) := \left(Y_A(\varphi)\ \ Y_{S2}(\varphi)\ \ Y_B(\varphi)\ \ Y_D(\varphi)\ \ Y_{S4}(\varphi)\ \ Y_H\right)^T$$

$$\varphi := 0, 0.01 .. 2\pi$$



$$X(f), X_A(\varphi), X_{S2}(\varphi), X_B(\varphi), X_D(\varphi), X_{S4}(\varphi), X_H(\varphi)$$

Определение аналогов скоростей:

$$V_{qAx}(\varphi) := \frac{d}{d\varphi} X_A(\varphi)$$

$$V_{qAy}(\varphi) := \frac{d}{d\varphi} Y_A(\varphi)$$

$$V_{qBx}(\varphi) := \frac{d}{d\varphi} X_B(\varphi)$$

$$V_{qBy}(\varphi) := \frac{d}{d\varphi} Y_B(\varphi)$$

$$V_{qS2x}(\varphi) := \frac{d}{d\varphi} X_{S2}(\varphi)$$

$$V_{qS2y}(\varphi) := \frac{d}{d\varphi} Y_{S2}(\varphi)$$

$$V_{qDx}(\varphi) := \frac{d}{d\varphi} X_D(\varphi)$$

$$V_{qDy}(\varphi) := \frac{d}{d\varphi} Y_D(\varphi)$$

$$V_{qAx}(f) = 0.301$$

$$V_{qAy}(f) = 0.173$$

$$V_{qBx}(f) = 0.357$$

$$V_{qBy}(f) = 0.036$$

$$V_{qS2x}(f) = 0.329$$

$$V_{qS2y}(f) = 0.105$$

$$V_{qDx}(f) = 0.713$$

$$V_{qDy}(f) = 0.072$$

Угловые аналоги:

$$\omega_{q2}(\varphi) := \frac{d}{d\varphi} \varphi_2(\varphi) \qquad \omega_{q2}(f) = -0.103$$

$$\omega_{q4}(\varphi) := \frac{d}{d\varphi} \varphi_4(\varphi) \qquad \omega_{q4}(f) = -0.048$$

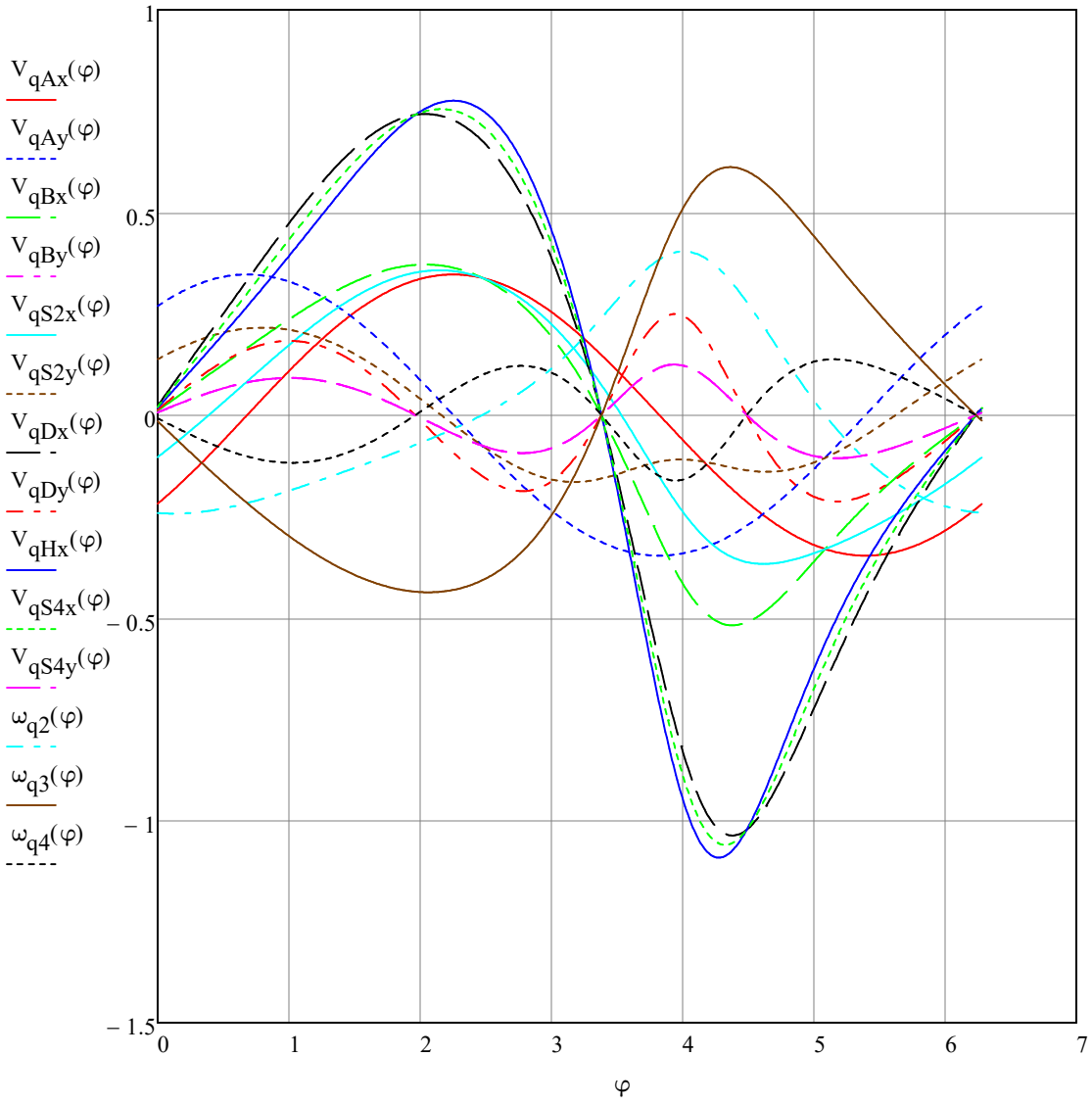
$$\omega_{q3}(\varphi) := \frac{d}{d\varphi} \varphi_3(\varphi) \qquad \omega_{q3}(f) = -0.422$$

$$V_{qHx}(\varphi) := \frac{d}{d\varphi} X_H(\varphi) \qquad V_{qHx}(f) = 0.675$$

$$V_{qHy}(\varphi) := \frac{d}{d\varphi} Y_H \qquad V_{qHy}(f) = 0$$

$$V_{qS4x}(\varphi) := \frac{d}{d\varphi} X_{S4}(\varphi) \qquad V_{qS4x}(f) = 0.694$$

$$V_{qS4y}(\varphi) := \frac{d}{d\varphi} Y_{S4}(\varphi) \qquad V_{qS4y}(f) = 0.036$$



Определение аналогов ускорений:

Угловые аналоги:

$$a_{qAx}(\varphi) := \frac{d^2}{d\varphi^2} X_A(\varphi) \qquad a_{qAx}(f) = 0.174$$

$$a_{qAy}(\varphi) := \frac{d^2}{d\varphi^2} Y_A(\varphi) \qquad a_{qAy}(f) = -0.301$$

$$a_{qBx}(\varphi) := \frac{d^2}{d\varphi^2} X_B(\varphi) \qquad a_{qBx}(f) = 0.093$$

$$a_{qBy}(\varphi) := \frac{d^2}{d\varphi^2} Y_B(\varphi) \qquad a_{qBy}(f) = -0.143$$

$$a_{qDx}(\varphi) := \frac{d^2}{d\varphi^2} X_D(\varphi) \qquad a_{qDx}(f) = 0.185$$

$$a_{qDy}(\varphi) := \frac{d^2}{d\varphi^2} Y_D(\varphi) \qquad a_{qDy}(f) = -0.285$$

$$a_{qHx}(\varphi) := \frac{d^2}{d\varphi^2} X_H(\varphi) \qquad a_{qHx}(f) = 0.331$$

$$a_{qHy}(\varphi) := \frac{d^2}{d\varphi^2} Y_H \qquad a_{qHy}(f) = 0$$

$$a_{qS2x}(\varphi) := \frac{d^2}{d\varphi^2} X_{S2}(\varphi) \qquad a_{qS2x}(f) = 0.133$$

$$a_{qS2y}(\varphi) := \frac{d^2}{d\varphi^2} Y_{S2}(\varphi) \qquad a_{qS2y}(f) = -0.222$$

$$a_{qS4x}(\varphi) := \frac{d^2}{d\varphi^2} X_{S4}(\varphi) \qquad a_{qS4x}(f) = 0.258$$

$$a_{qS4y}(\varphi) := \frac{d^2}{d\varphi^2} Y_{S4}(\varphi) \qquad a_{qS4y}(f) = -0.143$$

$$\varepsilon_{q2}(\varphi) := \frac{d^2}{d\varphi^2} \varphi_2(\varphi)$$

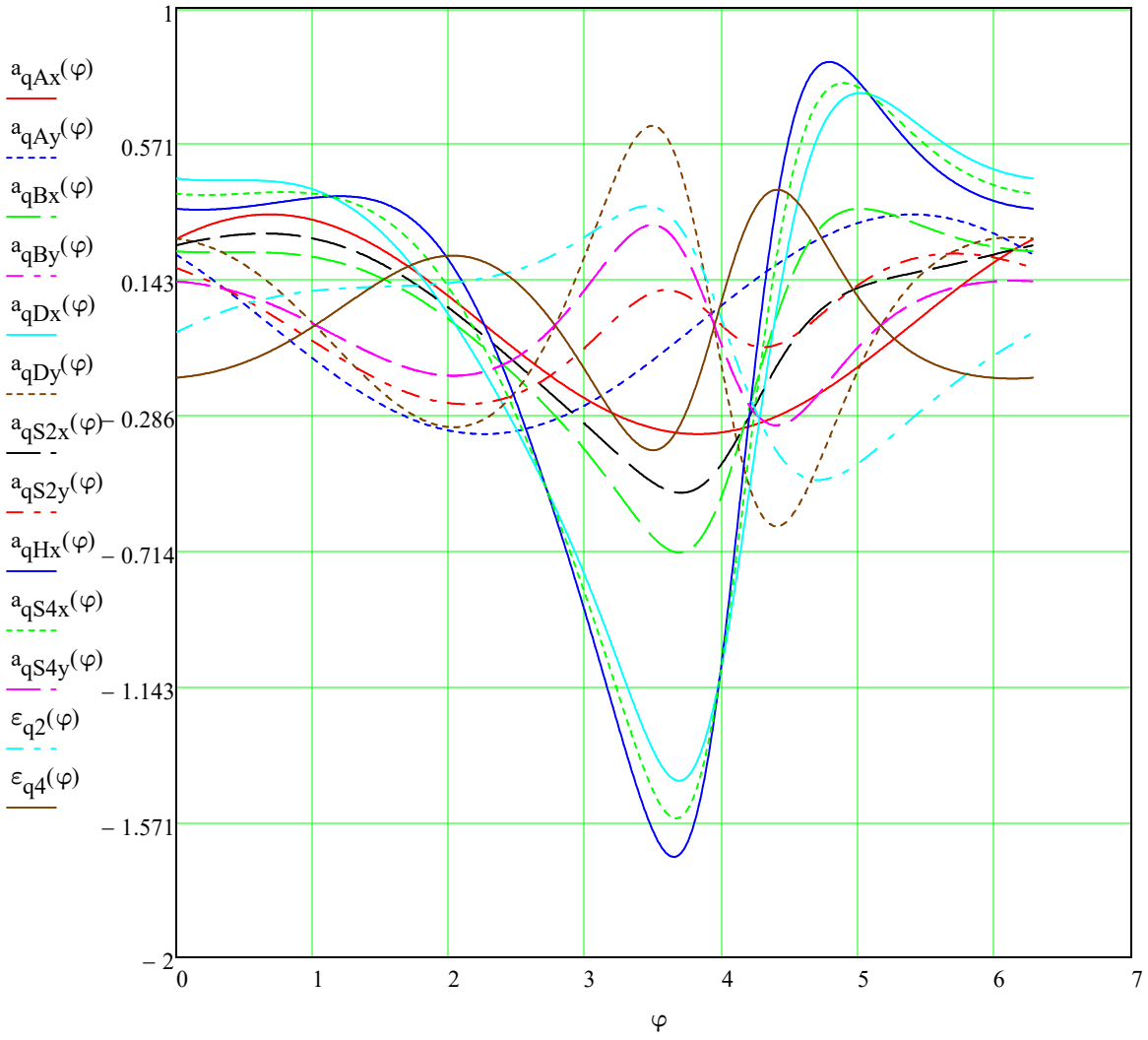
$$\varepsilon_{q3}(\varphi) := \frac{d^2}{d\varphi^2} \varphi_3(\varphi)$$

$$\varepsilon_{q4}(\varphi) := \frac{d^2}{d\varphi^2} \varphi_4(\varphi)$$

$$\varepsilon_{q2}(f) = 0.122$$

$$\varepsilon_{q3}(f) = -0.092$$

$$\varepsilon_{q4}(f) = 0.188$$



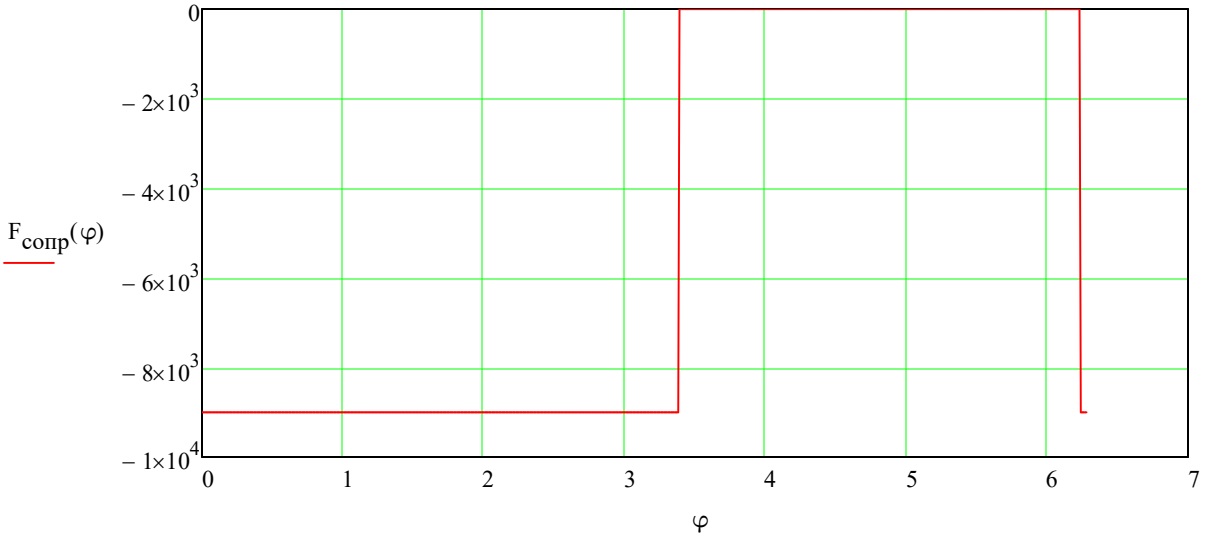
$G_2 := 90\ \text{Н}$ $G_3 := 160\ \text{Н}$ $G_4 := 220\ \text{Н}$ $G_5 := 35\ \text{Н}$ $P_{\text{п.с}} := 9000\ \text{Н}$

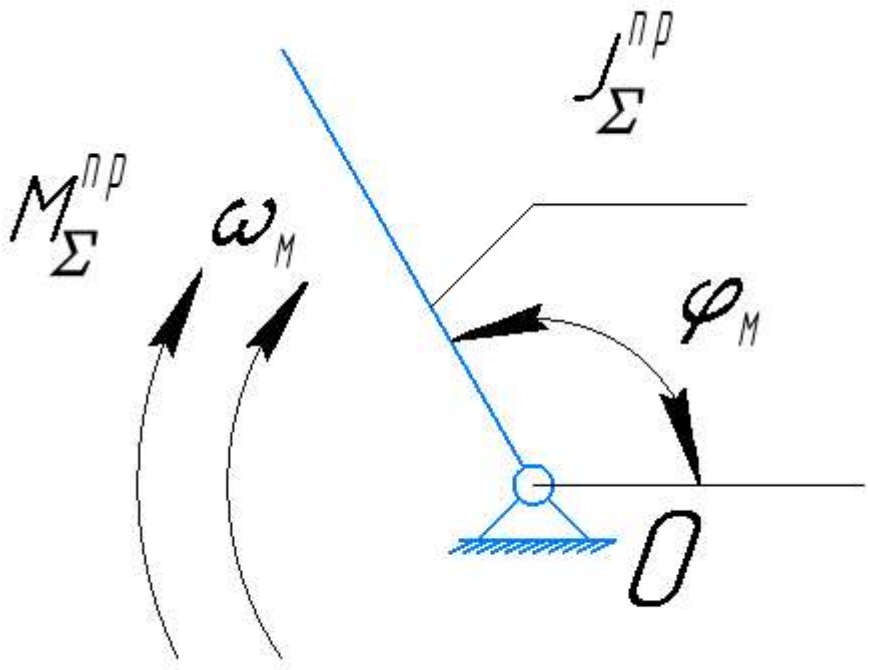
$m_2 := 9\ \text{кг}$ $m_3 := 16\ \text{кг}$ $m_4 := 22\ \text{кг}$ $m_5 := 3.5\ \text{кг}$

$J_{S2} := 0.45\ \text{кг}\cdot\text{м}^2$ $J_{S3} := 0.55\ \text{кг}\cdot\text{м}^2$ $J_{S4} := 1.61\ \text{кг}\cdot\text{м}^2$

$J_{к5} := 0.052\ \text{кг}\cdot\text{м}^2$ $J_{к6} := 0.063\ \text{кг}\cdot\text{м}^2$ $J_{\text{ред}} := 0.09\ \text{кг}\cdot\text{м}^2$

$$F_{\text{сопр}}(\varphi) := -P_{\text{п.с}}\cdot\left(V_{qHx}(\varphi) \geq 0\right)$$





$$J_{2пр1}(\varphi) := \omega_{q2}(\varphi)^2 J_{S2} + m_2 \cdot \left(V_{qS2x}(\varphi)^2 + V_{qS2y}(\varphi)^2 \right) + \omega_{q3}(\varphi)^2 J_{S3}$$

$$J_{2пр2}(\varphi) := m_2 \cdot \left(V_{qBx}(\varphi)^2 + V_{qBy}(\varphi)^2 \right) + \omega_{q4}(\varphi)^2 J_{S4} + m_4 \cdot \left(V_{qS4x}(\varphi)^2 + V_{qS4y}(\varphi)^2 \right)$$

$$J_{2пр}(\varphi) := J_{2пр1}(\varphi) + J_{2пр2}(\varphi) \qquad J_{2пр}(f) = 12.962 \text{ кг}\cdot\text{м}^2$$

$$dJ_{2пр1}(\varphi) := 2m_2 \cdot \left(V_{qBx}(\varphi) \cdot a_{qBx}(\varphi) + V_{qBy}(\varphi) \cdot a_{qBy}(\varphi) \right) + 2m_2 \cdot \left(V_{qS2x}(\varphi) \cdot a_{qS2x}(\varphi) + V_{qS2y}(\varphi) \cdot a_{qS2y}(\varphi) \right)$$

$$dJ_{2пр2}(\varphi) := 2\,\omega_{q4}(\varphi) J_{S4} \cdot \varepsilon_{q4}(\varphi) + 2\,\omega_{q3}(\varphi) J_{S3} \cdot \varepsilon_{q3}(\varphi) + 2m_4 \cdot \left(V_{qS4x}(\varphi) \cdot a_{qS4x}(\varphi) + V_{qS4y}(\varphi) \cdot a_{qS4y}(\varphi) \right)$$

$$dJ_{2пр}(\varphi) := dJ_{2пр1}(\varphi) + dJ_{2пр2}(\varphi) + 2\,\omega_{q2}(\varphi) J_{S2} \cdot \varepsilon_{q2}(\varphi)$$

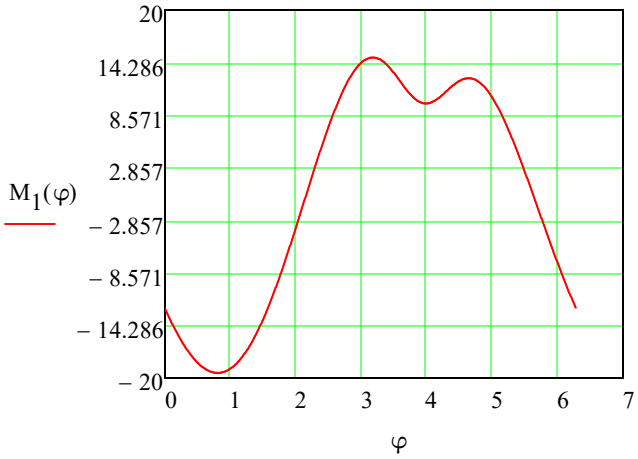
$M_{пр.с}(\varphi) := -G_2 \cdot V_{qS2y}(\varphi) - G_3 \cdot V_{qBy}(\varphi) - G_4 \cdot V_{qS4y}(\varphi) + F_{сопр}(\varphi) \cdot V_{qHx}(\varphi)$ $M_{пр.с}(f) = -6.1 \times 10^3$ Н·м

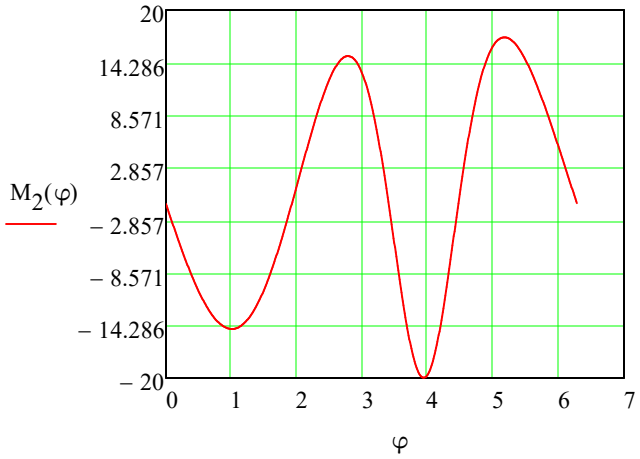
$M_1(\varphi) := -G_2 \cdot V_{qS2y}(\varphi)$

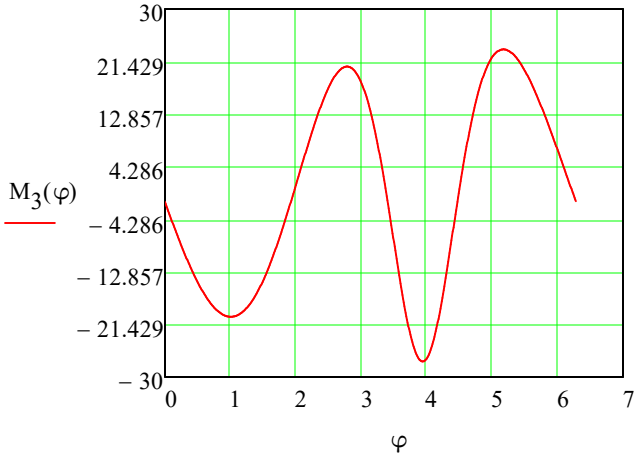
$M_2(\varphi) := -G_3 \cdot V_{qBy}(\varphi)$

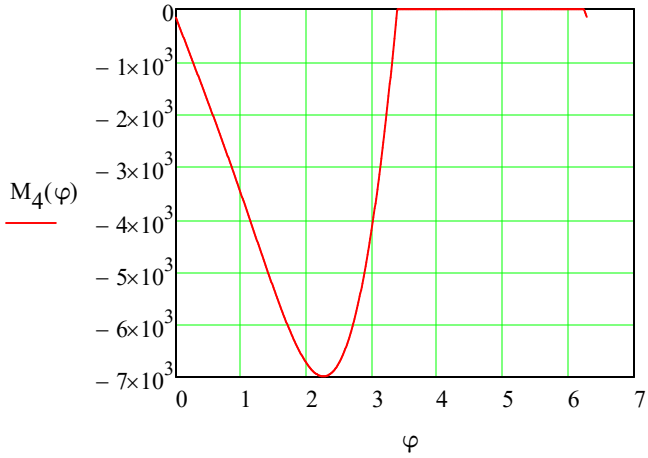
$M_3(\varphi) := -G_4 \cdot V_{qS4y}(\varphi)$

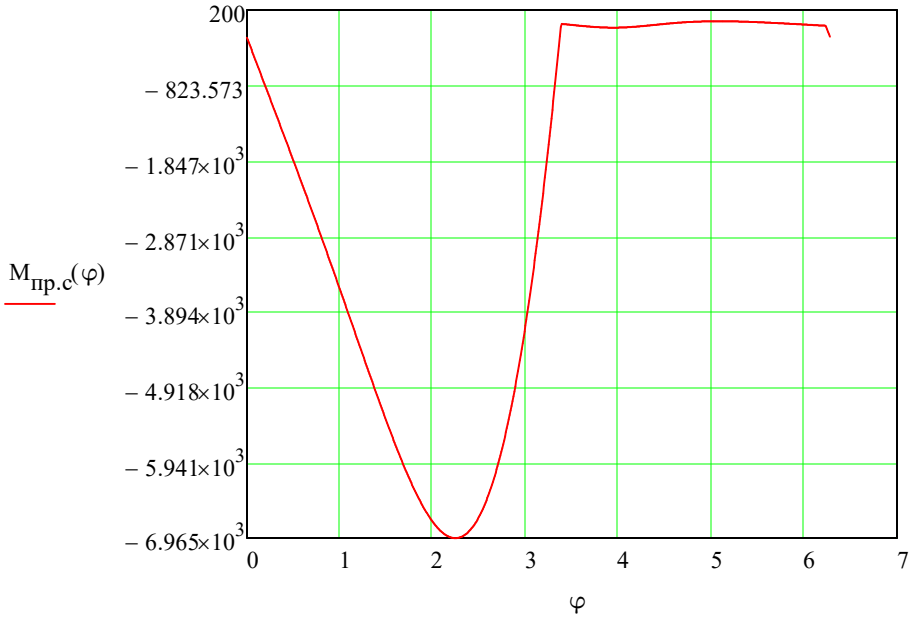
$M_4(\varphi) := F_{сопр}(\varphi) \cdot V_{qHx}(\varphi)$

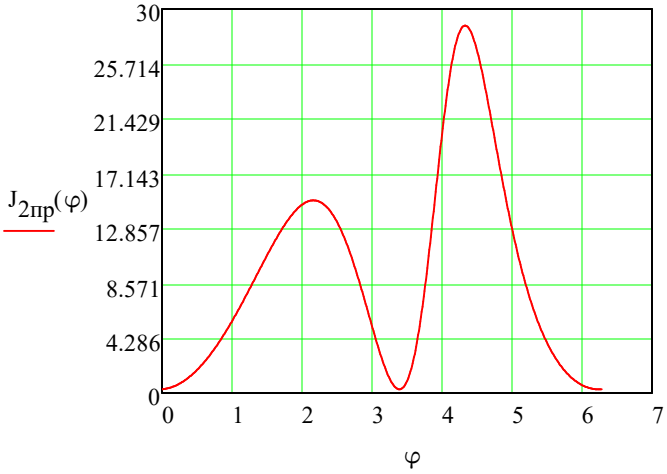


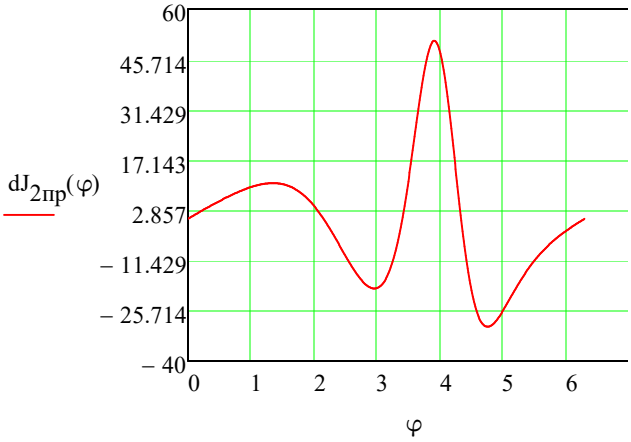












Вычислим работу сил сопротивления за цикл

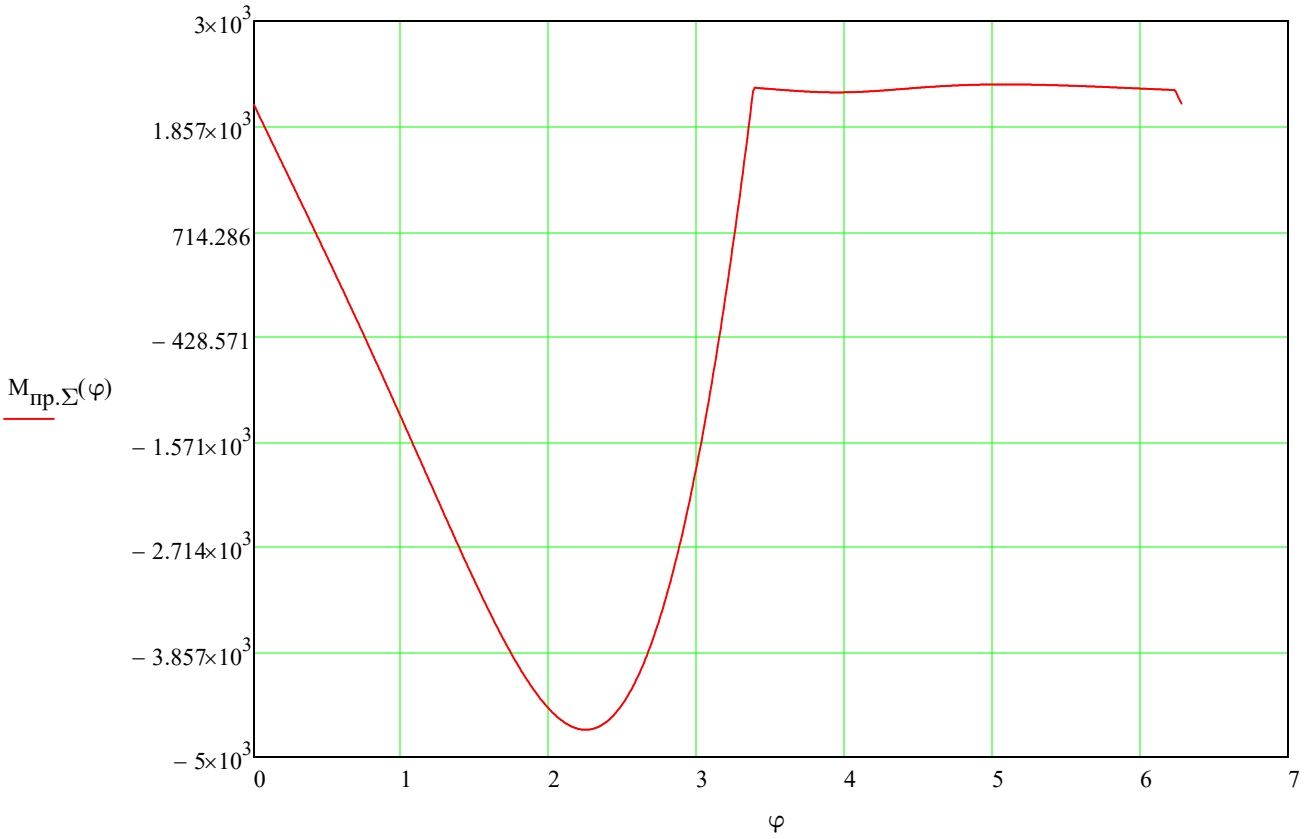
$$A_c := \int_0^{2\pi} M_{пр.с}(\varphi)\, d\varphi = -1.422 \times 10^4$$

Найдём приведённый движущий момент

$$M_{пр.дв} := \frac{-A_c}{2\pi} = 2.263 \times 10^3$$

Вычислим приведённый суммарный момент

$$M_{пр.\Sigma}(\varphi) := M_{пр.дв} + M_{пр.с}(\varphi)$$



Рассчитаем момент инерции первой группы звеньев
Вычислим работу суммарного момента

$$A_{пр.\Sigma}(\varphi) := \int_0^{\varphi} M_{пр.\Sigma}(\varphi)\, d\varphi \qquad A_{пр.дв}(\varphi) := \int_0^{\varphi} M_{пр.дв}\, d\varphi \qquad A_{пр.с}(\varphi) := \int_0^{\varphi} M_{пр.с}(\varphi)\, d\varphi$$

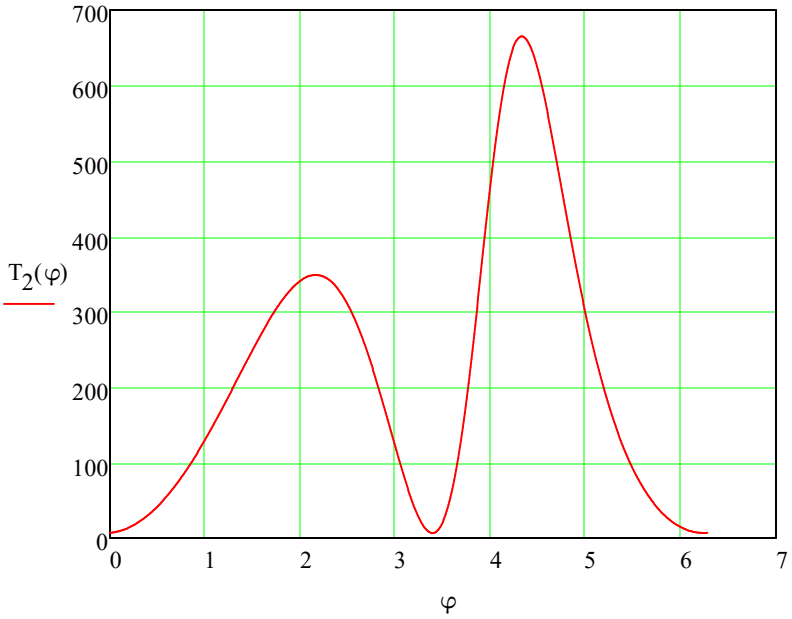
$$A_{пр.\Sigma 1}(\varphi) := A_{пр.дв}(\varphi) + A_{пр.с}(\varphi)$$

$$n_1 := 65$$

$$\omega_{1ср} := \frac{n_1 \cdot 2\pi}{60} = 6.807$$

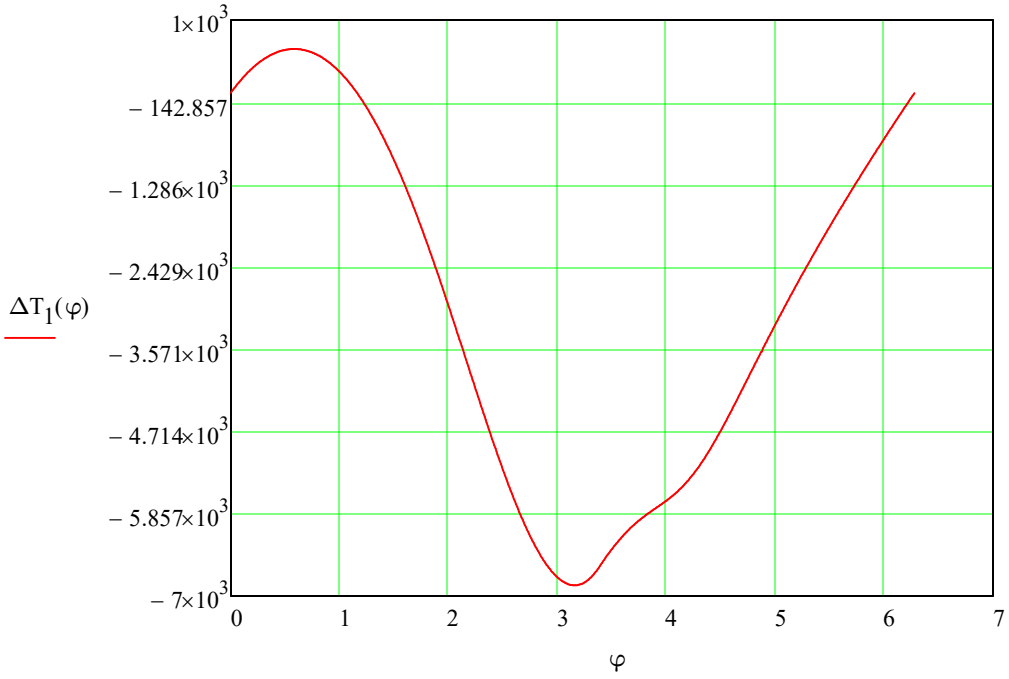
Определим кинетическую энергию второй группы звеньев:

$$T_2(\varphi) := J_{2пр}(\varphi) \cdot \frac{\omega_{1ср}^{\ 2}}{2}$$



Определим изменение кинетической энергии первой группы звеньев:

$$\Delta T_1(\varphi) := A_{пр.\Sigma}(\varphi) - T_2(\varphi)$$



$f_1 := 0.5$

$P := \text{Maximize}(\Delta T_1, f_1)$

$T_{1max} := \Delta T_1(P) = 599.736$

$\Delta T_{1нб} := T_{1max} - T_{1min} = 7.449 \times 10^3$

$f_2 := 3.2$

$P_1 := \text{Minimize}(\Delta T_1, f_2)$

$T_{1min} := \Delta T_1(P_1) = -6.85 \times 10^3$

$\delta := 0.11$

$$J_{1пр} := \frac{\Delta T_{1нб}}{\omega_{1ср}^{2} \cdot \delta} = 1.462 \times 10^{3}$$

График угловой скорости звена приведения:

$$\Delta\omega(\varphi) := \frac{\Delta T_1(\varphi) - \frac{T_{1max} + T_{1min}}{2}}{\omega_{1ср} \cdot J_{1пр}} \qquad \Delta\omega(f) = 0.133$$

$$\omega(\varphi) := \omega_{1ср} + \Delta\omega(\varphi) \qquad \omega(f) = 6.94$$

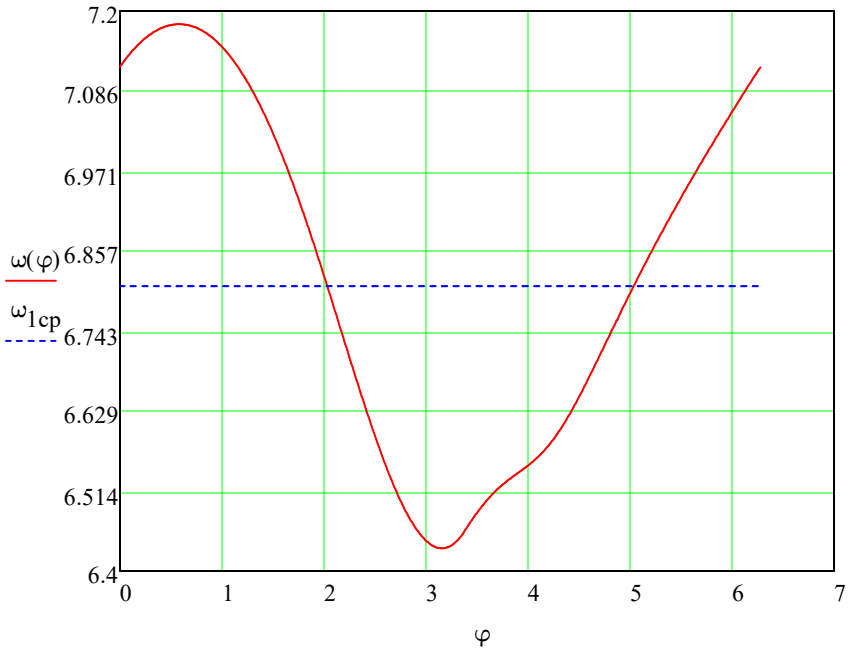
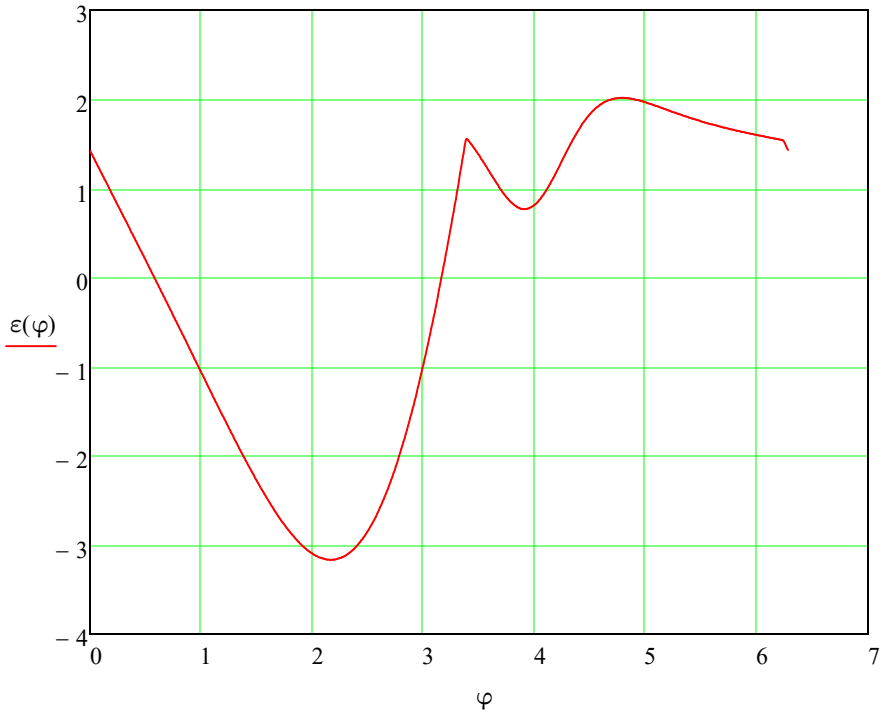


График углового ускорения звена приведения:

$$\varepsilon(\varphi) := \frac{M_{пр.\Sigma}(\varphi)}{J_{2пр}(\varphi) + J_{1пр}} - \frac{\omega(\varphi)^{2} \cdot dJ_{2пр}(\varphi)}{2 \cdot \left(J_{2пр}(\varphi) + J_{1пр}\right)} \qquad \varepsilon(f) = -2.742$$



$J_{O.пр} := 2.5 \ кг \cdot м^2$

$J_{доп} := J_{1пр} - J_{O.пр} = 1.459 \times 10^3 \ кг \cdot м^2$ Момент инерции дополнительной маховой массы (маховаика)

$\psi_b := 0.2 \quad \psi_h := 0.8 \quad \rho := 7800 \ \frac{кг}{м^3}$

Маховик - обход со спицами и ступицей

$D_2 := 0.437 \sqrt[5]{J_{доп}} = 1.876 \ м$

$D_1 := 0.8 D_2 = 1.501 \ м$

$b := 0.2 D_2 = 0.375 \ м$

$m_1 := 6123 \left(D_2^{\ 2} - D_1^{\ 2} \right) \cdot b = 2.912 \times 10^3 \ кг$

Маховик - диск

$D := 0.366 \sqrt[5]{J_{доп}} = 1.571 \ м$

$b := 0.2D = 0.314 \ м$

$m_2 := 1230 D^3 = 4.773 \times 10^3 \ кг$

Определение реальных скоростей

$\omega_2(\varphi) := \omega_{q2}(\varphi) \, \omega(\varphi)$ $\omega_2(f) = -0.713$

$\omega_4(\varphi) := \omega_{q4}(\varphi) \, \omega(\varphi)$ $\omega_4(f) = -0.332$

$V_{Ax}(\varphi) := \omega(\varphi) \cdot V_{qAx}(\varphi)$ $V_{Ax}(f) = 2.086$

$V_{Ay}(\varphi) := \omega(\varphi) \cdot V_{qAy}(\varphi)$ $V_{Ay}(f) = 1.204$

$$V_A(\varphi) := \sqrt{V_{Ax}(\varphi)^2 + V_{Ay}(\varphi)^2} \qquad V_A(f) = 2.408$$

$$V_{Dx}(\varphi) := \omega(\varphi)\cdot V_{qDx}(\varphi) \qquad V_{Dx}(f) = 4.949$$

$$V_{Dy}(\varphi) := \omega(\varphi)\cdot V_{qDy}(\varphi) \qquad V_{Dy}(f) = 0.499$$

$$V_D(\varphi) := \sqrt{V_{Dx}(\varphi)^2 + V_{Dy}(\varphi)^2} \qquad V_D(f) = 4.974$$

$$V_{Bx}(\varphi) := \omega(\varphi)\cdot V_{qBx}(\varphi) \qquad V_{Bx}(f) = 2.474$$

$$V_{By}(\varphi) := \omega(\varphi)\cdot V_{qBy}(\varphi) \qquad V_{By}(f) = 0.25$$

$$V_B(\varphi) := \sqrt{V_{Bx}(\varphi)^2 + V_{By}(\varphi)^2} \qquad V_B(f) = 2.487$$

$$V_{Hx}(\varphi) := \omega(\varphi)\cdot V_{qHx}(\varphi) \qquad V_{Hx}(f) = 4.686$$

$$V_{Hy}(\varphi) := \omega(\varphi)\cdot V_{qHy}(\varphi) \qquad V_{Hy}(f) = 0$$

$$V_H(\varphi) := \sqrt{V_{Hx}(\varphi)^2 + V_{Hy}(\varphi)^2} \qquad V_H(f) = 4.686$$

$$V_{S4x}(\varphi) := \omega(\varphi)\cdot V_{qS4x}(\varphi) \qquad V_{S4x}(f) = 4.818$$

$$V_{S4y}(\varphi) := \omega(\varphi)\cdot V_{qS4y}(\varphi) \qquad V_{S4y}(f) = 0.25$$

$$V_{S4}(\varphi) := \sqrt{V_{S4x}(\varphi)^2 + V_{S4y}(\varphi)^2} \qquad V_{S4}(f) = 4.824$$

$$V_{S2x}(\varphi) := \omega(\varphi)\cdot V_{qS2x}(\varphi) \qquad V_{S2x}(f) = 2.28$$

$$V_{S2y}(\varphi) := \omega(\varphi)\cdot V_{qS2y}(\varphi) \qquad V_{S2y}(f) = 0.727$$

$$V_{S2}(\varphi) := \sqrt{V_{S2x}(\varphi)^2 + V_{S2y}(\varphi)^2} \qquad V_{S2}(f) = 2.393$$

Реальные значения ускорений:

$$a_{Ax}(\varphi) := \omega(\varphi)^2 a_{qAx}(\varphi) + \varepsilon(\varphi)\cdot V_{qAx}(\varphi) \qquad a_{Ax}(f) = 7.533$$

$$a_{Ay}(\varphi) := \omega(\varphi)^2 a_{qAy}(\varphi) + \varepsilon(\varphi)\cdot V_{qAy}(\varphi) \qquad a_{Ay}(f) = -14.95$$

$$a_A(\varphi) := \sqrt{a_{Ax}(\varphi)^2 + a_{Ay}(\varphi)^2} \qquad a_A(f) = 16.74$$

$$a_{Bx}(\varphi) := \omega(\varphi)^2 a_{qBx}(\varphi) + \varepsilon(\varphi)\cdot V_{qBx}(\varphi) \qquad a_{Bx}(f) = 3.485$$

$$a_{By}(\varphi) := \omega(\varphi)^2 a_{qBy}(\varphi) + \varepsilon(\varphi)\cdot V_{qBy}(\varphi) \qquad a_{By}(f) = -6.962$$

$$a_B(\varphi) := \sqrt{a_{Bx}(\varphi)^2 + a_{By}(\varphi)^2} \qquad a_B(f) = 7.785$$

$$a_{S2y}(\varphi) := \omega(\varphi)^2 a_{qS2y}(\varphi) + \varepsilon(\varphi)\cdot V_{qS2y}(\varphi) \qquad a_{S2y}(f) = -10.956$$

$$a_{S2x}(\varphi) := \omega(\varphi)^2 a_{qS2x}(\varphi) + \varepsilon(\varphi)\cdot V_{qS2x}(\varphi) \qquad a_{S2x}(f) = 5.509$$

$$a_{S2}(\varphi) := \sqrt{a_{S2x}(\varphi)^2 + a_{S2y}(\varphi)^2} \qquad a_{S2}(f) = 12.263$$

$$a_{Dx}(\varphi) := \omega(\varphi)^2 a_{qDx}(\varphi) + \varepsilon(\varphi)\cdot V_{qDx}(\varphi) \qquad a_{Dx}(f) = 6.969$$

$$a_{Dy}(\varphi) := \omega(\varphi)^2 a_{qDy}(\varphi) + \varepsilon(\varphi)\cdot V_{qDy}(\varphi) \qquad a_{Dy}(f) = -13.924$$

$$a_{D}(\varphi) := \sqrt{a_{Dx}(\varphi)^2 + a_{Dy}(\varphi)^2} \qquad a_{D}(f) = 15.571$$

$$a_{Hx}(\varphi) := \omega(\varphi)^2 a_{qHx}(\varphi) + \varepsilon(\varphi)\cdot V_{qHx}(\varphi)$$

$$a_{Hy}(\varphi) := \omega(\varphi)^2 a_{qHy}(\varphi) + \varepsilon(\varphi)\cdot V_{qHy}(\varphi)$$

$$a_{H}(\varphi) := \sqrt{a_{Hx}(\varphi)^2 + a_{Hy}(\varphi)^2} \qquad a_{H}(f) = 14.082$$

$$a_{S4x}(\varphi) := \omega(\varphi)^2 a_{qS4x}(\varphi) + \varepsilon(\varphi)\cdot V_{qS4x}(\varphi)$$

$$a_{S4y}(\varphi) := \omega(\varphi)^2 a_{qS4y}(\varphi) + \varepsilon(\varphi)\cdot V_{qS4y}(\varphi)$$

$$a_{S4}(\varphi) := \sqrt{a_{S4x}(\varphi)^2 + a_{S4y}(\varphi)^2} \qquad a_{S4}(f) = 12.62$$

$$\varepsilon_2(\varphi) := \omega(\varphi)^2\cdot\varepsilon_{q2}(\varphi) + \varepsilon(\varphi)\cdot\omega_{q2}(\varphi) \qquad \varepsilon_2(f) = 6.176$$

$$\varepsilon_4(\varphi) := \omega(\varphi)^2\cdot\varepsilon_{q4}(\varphi) + \varepsilon(\varphi)\cdot\omega_{q4}(\varphi) \qquad \varepsilon_4(f) = 9.197$$

Силовой расчет

	$O_{1в}$	$A_{1в}$	$B_{1в}$	$C_{1в}$	$D_{1в}$	$H_{1в}$	$H_{1п}$
1	1	1	0	0	0	0	0
2	0	–1	1	0	0	0	0
3	0	0	0	1	1	0	0
4	0	0	0	0	–1	1	0
5	0	0	0	0	0	–1	1
0	–1	0	0	0	0	0	–1

Инерционная нагрузка и силы тяжести:

Звено 1

$$\Phi_{1x}(\varphi) := 0 \qquad \Phi_{1x}(f) = 0$$

$$\Phi_{1y}(\varphi) := 0 \qquad \Phi_{1y}(f) = 0$$

$$G_{1x} := 0$$

$$G_{1y} := -G_2$$

$$M_{\Phi 1}(\varphi) := -J_{1пр}\cdot\varepsilon(\varphi)$$