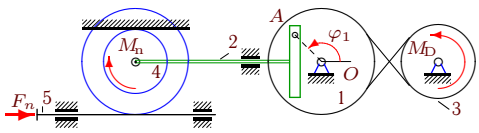
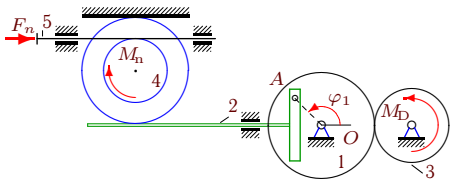
Получить уравнение движения кулисного механизма. Найти значение углового ускорения $\ddot{\varphi}_1$ при $t = 0$.

Вариант 1



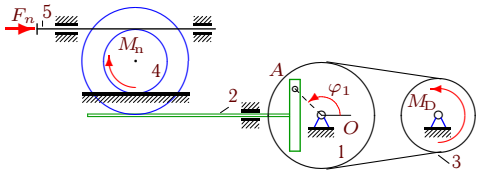
$M_{D_z} = M_0 - k\omega_{3_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$F_{n_x} = -\nu v_{5_x}$,
$M_0 = 13$Нм, $k = 15$Нмс,
$\nu = 20$Нс/м, $\mu = 10$Нмс,
$I_1 = 18$кгм^2, $m_2 = 18$кг,
$m_3 = 36$кг, $m_4 = 28$кг,
$R_1 = 38$см, $r_1 = 27$см,
$R_3 = 28$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 17$см,
$\varphi_{1,0} = 1.5$, $\omega_{1_z,0} = 0.5\frac{1}{c}$.

Вариант 2



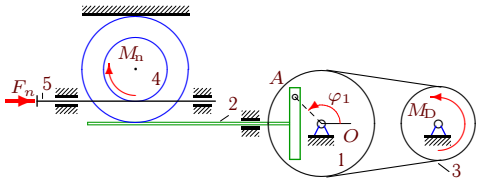
$M_{D_z} = M_0 - k\omega_{3_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$F_{n_x} = -\nu v_{5_x}$,
$M_0 = 9$Нм, $k = 11$Нмс,
$\nu = 8$кНс/м, $\mu = 13$Нмс,
$I_1 = 6$кгм^2, $m_2 = 16$кг,
$m_3 = 34$кг, $m_4 = 26$кг,
$R_1 = 34$см, $r_1 = 23$см,
$R_3 = 24$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 15$см,
$\varphi_{1,0} = 1.3$, $\omega_{1_z,0} = 0.1\frac{1}{c}$.

Вариант 3



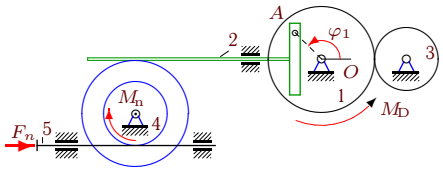
$M_{D_z} = M_0 - k\omega_{3_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$F_{n_x} = -\nu v_{5_x}$,
$M_0 = 12$Нм, $k = 15$Нмс,
$\nu = 35$Нс/м, $\mu = 10$Нмс,
$I_1 = 13$кгм^2, $m_2 = 18$кг,
$m_3 = 36$кг, $m_4 = 28$кг,
$R_1 = 38$см, $r_1 = 27$см,
$R_3 = 28$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 17$см,
$\varphi_{1,0} = 1.5$, $\omega_{1_z,0} = 0.5\frac{1}{c}$.

Вариант 4



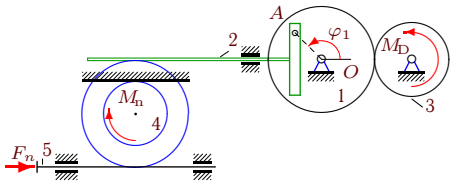
$M_{D_z} = M_0 - k\omega_{3_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$F_{n_x} = -\nu v_{5_x}$,
$M_0 = 10$Нм, $k = 15$Нмс,
$\nu = 30$Нс/м, $\mu = 13$Нмс,
$I_1 = 9$кгм^2, $m_2 = 16$кг,
$m_3 = 34$кг, $m_4 = 26$кг,
$R_1 = 38$см, $r_1 = 27$см,
$R_3 = 28$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 15$см,
$\varphi_{1,0} = 1.3$, $\omega_{1_z,0} = 0.5\frac{1}{c}$.

Вариант 5



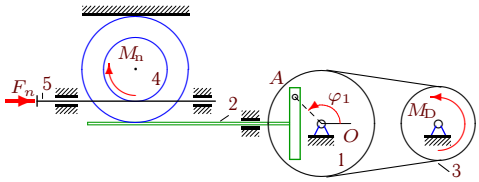
$M_{D_z} = M_0 - k\omega_{1_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$F_{n_x} = -\nu v_{5_x}$,
$M_0 = 13$Нм, $k = 11$Нмс,
$\nu = 8$кНс/м, $\mu = 11$Нмс,
$I_1 = 19$кгм^2, $m_2 = 17$кг,
$m_3 = 35$кг, $m_4 = 27$кг,
$R_1 = 34$см, $r_1 = 23$см,
$R_3 = 24$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 16$см,
$\varphi_{1,0} = 1.4$, $\omega_{1_z,0} = 0.1\frac{1}{c}$.

Вариант 6



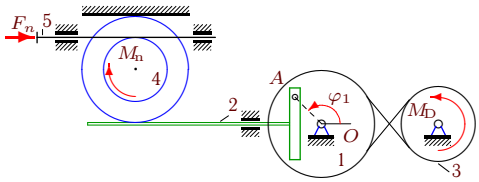
$M_{D_z} = M_0 - k\omega_{3_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$F_{n_x} = -\nu v_{5_x}$,
$M_0 = 7$Нм, $k = 12$Нмс,
$\nu = 40$Нс/м, $\mu = 15$Нмс,
$I_1 = 4$кгм^2, $m_2 = 14$кг,
$m_3 = 32$кг, $m_4 = 24$кг,
$R_1 = 35$см, $r_1 = 24$см,
$R_3 = 25$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 13$см,
$\varphi_{1,0} = 1.1$, $\omega_{1_z,0} = 0.2\frac{1}{c}$.

Вариант 7



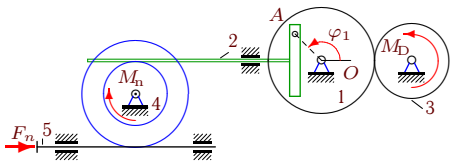
$M_{D_z} = M_0 - k\omega_{3_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$F_{n_x} = -\nu v_{5_x}$,
$M_0 = 9$Нм, $k = 11$Нмс,
$\nu = 35$Нс/м, $\mu = 14$Нмс,
$I_1 = 7$кгм^2, $m_2 = 15$кг,
$m_3 = 33$кг, $m_4 = 25$кг,
$R_1 = 34$см, $r_1 = 23$см,
$R_3 = 24$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 14$см,
$\varphi_{1,0} = 1.2$, $\omega_{1_z,0} = 0.1\frac{1}{c}$.

Вариант 8



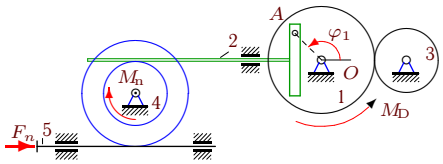
$M_{D_z} = M_0 - k\omega_{3_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$F_{n_x} = -\nu v_{5_x}$,
$M_0 = 9$Нм, $k = 11$Нмс,
$\nu = 8$кНс/м, $\mu = 15$Нмс,
$I_1 = 6$кгм^2, $m_2 = 14$кг,
$m_3 = 32$кг, $m_4 = 24$кг,
$R_1 = 34$см, $r_1 = 23$см,
$R_3 = 24$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 13$см,
$\varphi_{1,0} = 1.1$, $\omega_{1_z,0} = 0.1\frac{1}{c}$.

Вариант 9



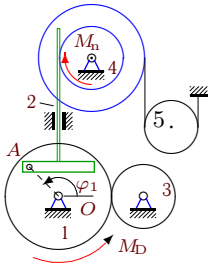
$M_{D_z} = M_0 - k\omega_{3_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$F_{n_x} = -\nu v_{5_x}$,
$M_0 = 8$Нм, $k = 14$Нмс,
$\nu = 8$кНс/м, $\mu = 13$Нмс,
$I_1 = 5$кгм^2, $m_2 = 15$кг,
$m_3 = 33$кг, $m_4 = 25$кг,
$R_1 = 37$см, $r_1 = 26$см,
$R_3 = 27$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 14$см,
$\varphi_{1,0} = 1.2$, $\omega_{1_z,0} = 0.4\frac{1}{c}$.

Вариант 10



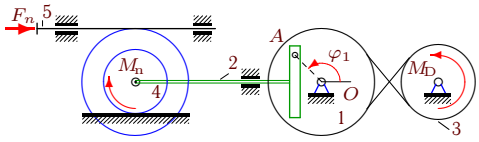
$M_{D_z} = M_0 - k\omega_{1_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$F_{n_x} = -\nu v_{5_x}$,
$M_0 = 10$Нм, $k = 15$Нмс,
$\nu = 8$кНс/м, $\mu = 14$Нмс,
$I_1 = 7$кгм^2, $m_2 = 14$кг,
$m_3 = 32$кг, $m_4 = 24$кг,
$R_1 = 38$см, $r_1 = 27$см,
$R_3 = 28$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 13$см,
$\varphi_{1,0} = 1.1$, $\omega_{1_z,0} = 0.5\frac{1}{c}$.

Вариант 11



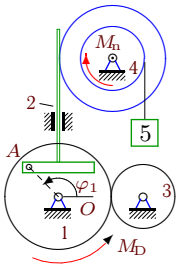
$M_{D_z} = M_0 - k\omega_{1_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$M_0 = 12$Нм,$k = 15$Нмс,
$\mu = 12$Нмс, $I_1 = 15$кгм^2,
$m_2 = 16$кг, $m_3 = 34$кг,
$m_4 = 26$кг, $m_5 = 6$кг,
$R_1 = 38$см, $r_1 = 27$см,
$R_3 = 28$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 15$см,
$r_5 = 13$см,
$\varphi_{1,0} = 1.3$, $\omega_{1_z,0} = 0.5\frac{1}{c}$.

Вариант 12



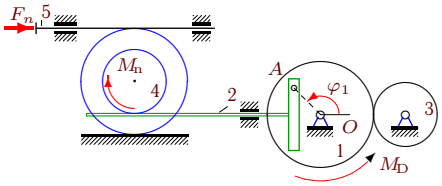
$M_{D_z} = M_0 - k\omega_{3_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$F_{n_x} = -\nu v_{5_x}$,
$M_0 = 9$Нм, $k = 12$Нмс,
$\nu = 40$Нс/м, $\mu = 15$Нмс,
$I_1 = 6$кгм^2, $m_2 = 14$кг,
$m_3 = 32$кг, $m_4 = 24$кг,
$R_1 = 35$см, $r_1 = 24$см,
$R_3 = 25$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 13$см,
$\varphi_{1,0} = 1.1$, $\omega_{1_z,0} = 0.2\frac{1}{c}$.

Вариант 13



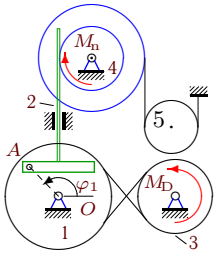
$M_{D_z} = M_0 - k\omega_{1_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$M_0 = 12$Нм, $k = 15$Нмс,
$\mu = 13$Нмс, $I_1 = 15$кгм^2,
$m_2 = 16$кг, $m_3 = 34$кг,
$m_4 = 26$кг, $m_5 = 7$кг,
$R_1 = 38$см, $r_1 = 27$см,
$R_3 = 28$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 15$см,
$\varphi_{1,0} = 1.3$, $\omega_{1_z,0} = 0.5\frac{1}{c}$.

Вариант 14



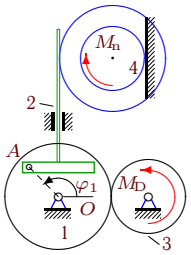
$M_{D_z} = M_0 - k\omega_{1_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$F_{n_x} = -\nu v_{5_x}$,
$M_0 = 14$Нм, $k = 11$Нмс,
$\nu = 10$Нс/м, $\mu = 11$Нмс,
$I_1 = 23$кгм^2, $m_2 = 18$кг,
$m_3 = 36$кг, $m_4 = 28$кг,
$R_1 = 34$см, $r_1 = 23$см,
$R_3 = 24$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 17$см,
$\varphi_{1,0} = 1.5$, $\omega_{1_z,0} = 0.1\frac{1}{c}$.

Вариант 15



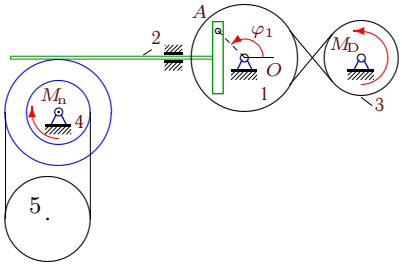
$M_{D_z} = M_0 - k\omega_{3_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$M_0 = 9$Нм,$k = 13$Нмс,
$\mu = 14$Нмс, $I_1 = 6$кгм^2,
$m_2 = 14$кг, $m_3 = 32$кг,
$m_4 = 24$кг, $m_5 = 3$кг,
$R_1 = 36$см, $r_1 = 25$см,
$R_3 = 26$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 13$см,
$r_5 = 12$см,
$\varphi_{1,0} = 1.1$, $\omega_{1_z,0} = 0.3\frac{1}{c}$.

Вариант 16



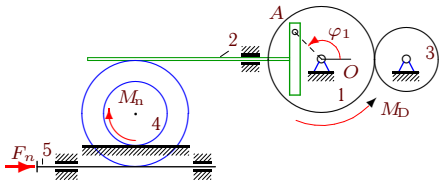
$M_{D_z} = M_0 - k\omega_{3_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$M_0 = 11$Нм, $k = 15$Нмс,
$\mu = 11$Нмс,
$I_1 = 8$кгм^2, $m_2 = 18$кг,
$m_3 = 36$кг, $m_4 = 28$кг,
$R_1 = 38$см, $r_1 = 27$см,
$R_3 = 28$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 17$см,
$\varphi_{1,0} = 1.5$, $\omega_{1_z,0} = 0.5\frac{1}{c}$.

Вариант 17



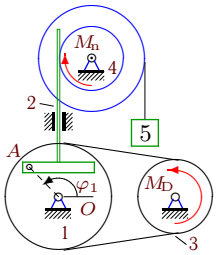
$M_{D_z} = M_0 - k\omega_{3_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$M_0 = 11$Нм,$k = 13$Нмс,
$\mu = 13$Нмс, $I_1 = 12$кгм^2,
$m_2 = 16$кг, $m_3 = 34$кг,
$m_4 = 26$кг, $m_5 = 60$кг,
$R_1 = 36$см, $r_1 = 25$см,
$R_3 = 26$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 15$см,
$r_5 = 16$см,
$\varphi_{1,0} = 1.3$, $\omega_{1_z,0} = 0.3\frac{1}{c}$.

Вариант 18



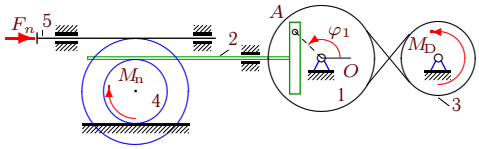
$M_{D_z} = M_0 - k\omega_{1_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$F_{n_x} = -\nu v_{5_x}$,
$M_0 = 13$Нм, $k = 14$Нмс,
$\nu = 8$кНс/м, $\mu = 11$Нмс,
$I_1 = 19$кгм^2, $m_2 = 17$кг,
$m_3 = 35$кг, $m_4 = 27$кг,
$R_1 = 37$см, $r_1 = 26$см,
$R_3 = 27$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 16$см,
$\varphi_{1,0} = 1.4$, $\omega_{1_z,0} = 0.4\frac{1}{c}$.

Вариант 19



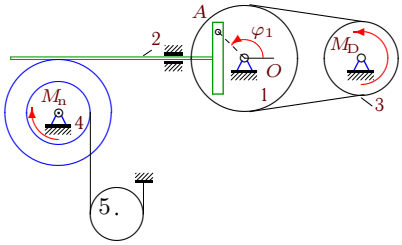
$M_{D_z} = M_0 - k\omega_{3_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$M_0 = 8$Нм, $k = 11$Нмс,
$\mu = 14$Нмс, $I_1 = 5$кгм^2,
$m_2 = 14$кг, $m_3 = 32$кг,
$m_4 = 24$кг, $m_5 = 2$кг,
$R_1 = 34$см, $r_1 = 23$см,
$R_3 = 24$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 13$см,
$\varphi_{1,0} = 1.1$, $\omega_{1_z,0} = 0.1\frac{1}{c}$.

Вариант 20



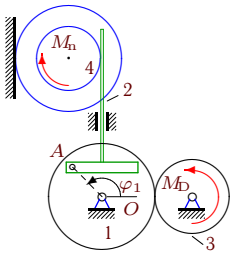
$M_{D_z} = M_0 - k\omega_{3_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$F_{n_x} = -\nu v_{5_x}$,
$M_0 = 11$Нм, $k = 12$Нмс,
$\nu = 30$Нс/м, $\mu = 13$Нмс,
$I_1 = 12$кгм^2, $m_2 = 16$кг,
$m_3 = 34$кг, $m_4 = 26$кг,
$R_1 = 35$см, $r_1 = 24$см,
$R_3 = 25$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 15$см,
$\varphi_{1,0} = 1.3$, $\omega_{1_z,0} = 0.2\frac{1}{c}$.

Вариант 21



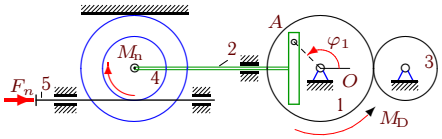
$M_{D_z} = M_0 - k\omega_{3_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$M_0 = 9$Нм,$k = 13$Нмс,
$\mu = 14$Нмс, $I_1 = 7$кгм^2,
$m_2 = 15$кг, $m_3 = 33$кг,
$m_4 = 25$кг, $m_5 = 4$кг,
$R_1 = 36$см, $r_1 = 25$см,
$R_3 = 26$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 14$см,
$r_5 = 11$см,
$\varphi_{1,0} = 1.2$, $\omega_{1_z,0} = 0.3\frac{1}{c}$.

Вариант 22



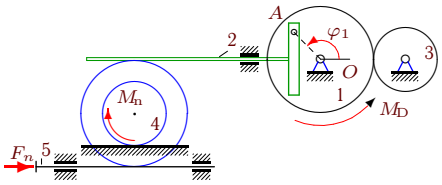
$M_{D_z} = M_0 - k\omega_{3_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$M_0 = 9$Нм, $k = 11$Нмс,
$\mu = 12$Нмс,
$I_1 = 6$кгм^2, $m_2 = 16$кг,
$m_3 = 34$кг, $m_4 = 26$кг,
$R_1 = 34$см, $r_1 = 23$см,
$R_3 = 24$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 15$см,
$\varphi_{1,0} = 1.3$, $\omega_{1_z,0} = 0.1\frac{1}{c}$.

Вариант 23



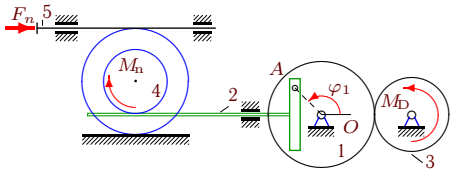
$M_{D_z} = M_0 - k\omega_{1_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$F_{n_x} = -\nu v_{5_x}$,
$M_0 = 13$Нм, $k = 15$Нмс,
$\nu = 25$Нс/м, $\mu = 11$Нмс,
$I_1 = 19$кгм^2, $m_2 = 17$кг,
$m_3 = 35$кг, $m_4 = 27$кг,
$R_1 = 38$см, $r_1 = 27$см,
$R_3 = 28$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 16$см,
$\varphi_{1,0} = 1.4$, $\omega_{1_z,0} = 0.5\frac{1}{c}$.

Вариант 24



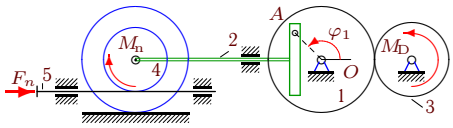
$M_{D_z} = M_0 - k\omega_{1_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$F_{n_x} = -\nu v_{5_x}$,
$M_0 = 14$Нм, $k = 14$Нмс,
$\nu = 8$кНс/м, $\mu = 10$Нмс,
$I_1 = 23$кгм^2, $m_2 = 18$кг,
$m_3 = 36$кг, $m_4 = 28$кг,
$R_1 = 37$см, $r_1 = 26$см,
$R_3 = 27$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 17$см,
$\varphi_{1,0} = 1.5$, $\omega_{1_z,0} = 0.4\frac{1}{c}$.

Вариант 25



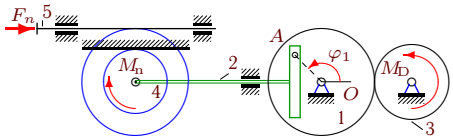
$M_{D_z} = M_0 - k\omega_{3_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$F_{n_x} = -\nu v_{5_x}$,
$M_0 = 11$Нм, $k = 12$Нмс,
$\nu = 10$Нс/м, $\mu = 11$Нмс,
$I_1 = 8$кгм^2, $m_2 = 18$кг,
$m_3 = 36$кг, $m_4 = 28$кг,
$R_1 = 35$см, $r_1 = 24$см,
$R_3 = 25$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 17$см,
$\varphi_{1,0} = 1.5$, $\omega_{1_z,0} = 0.2\frac{1}{c}$.

Вариант 26



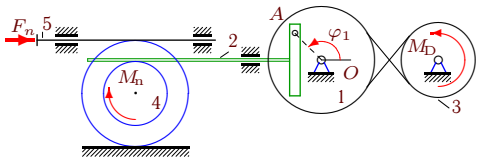
$M_{D_z} = M_0 - k\omega_{3_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$F_{n_x} = -\nu v_{5_x}$,
$M_0 = 10$Нм, $k = 13$Нмс,
$\nu = 8$кНс/м, $\mu = 11$Нмс,
$I_1 = 7$кгм^2, $m_2 = 17$кг,
$m_3 = 35$кг, $m_4 = 27$кг,
$R_1 = 36$см, $r_1 = 25$см,
$R_3 = 26$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 16$см,
$\varphi_{1,0} = 1.4$, $\omega_{1_z,0} = 0.3\frac{1}{c}$.

Вариант 27



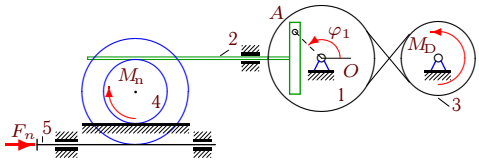
$M_{D_z} = M_0 - k\omega_{3_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$F_{n_x} = -\nu v_{5_x}$,
$M_0 = 10$Нм, $k = 11$Нмс,
$\nu = 8$кНс/м, $\mu = 12$Нмс,
$I_1 = 7$кгм^2, $m_2 = 17$кг,
$m_3 = 35$кг, $m_4 = 27$кг,
$R_1 = 34$см, $r_1 = 23$см,
$R_3 = 24$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 16$см,
$\varphi_{1,0} = 1.4$, $\omega_{1_z,0} = 0.1\frac{1}{c}$.

Вариант 28



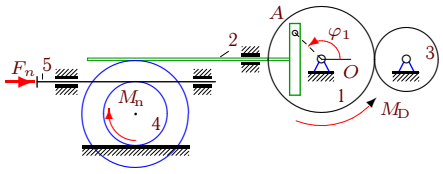
$M_{D_z} = M_0 - k\omega_{3_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$F_{n_x} = -\nu v_{5_x}$,
$M_0 = 13$Нм, $k = 13$Нмс,
$\nu = 10$Нс/м, $\mu = 11$Нмс,
$I_1 = 18$кгм^2, $m_2 = 18$кг,
$m_3 = 36$кг, $m_4 = 28$кг,
$R_1 = 36$см, $r_1 = 25$см,
$R_3 = 26$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 17$см,
$\varphi_{1,0} = 1.5$, $\omega_{1_z,0} = 0.3\frac{1}{c}$.

Вариант 29



$M_{D_z} = M_0 - k\omega_{3_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$F_{n_x} = -\nu v_{5_x}$,
$M_0 = 9$Нм, $k = 12$Нмс,
$\nu = 8$кНс/м, $\mu = 14$Нмс,
$I_1 = 6$кгм^2, $m_2 = 14$кг,
$m_3 = 32$кг, $m_4 = 24$кг,
$R_1 = 35$см, $r_1 = 24$см,
$R_3 = 25$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 13$см,
$\varphi_{1,0} = 1.1$, $\omega_{1_z,0} = 0.2\frac{1}{c}$.

Вариант 30



$M_{D_z} = M_0 - k\omega_{1_z}$,
$M_{n_z} = -\mu\omega_{4_z}$,
$F_{n_x} = -\nu v_{5_x}$,
$M_0 = 14$Нм, $k = 11$Нмс,
$\nu = 35$Нс/м, $\mu = 11$Нмс,
$I_1 = 23$кгм^2, $m_2 = 18$кг,
$m_3 = 36$кг, $m_4 = 28$кг,
$R_1 = 34$см, $r_1 = 23$см,
$R_3 = 24$см, $R_4 = 20$см,
$r_4 = 12$см, $i_4 = 17$см,
$\varphi_{1,0} = 1.5$, $\omega_{1_z,0} = 0.1\frac{1}{c}$.

Ответы

$T = (\dot{\varphi}^2/2)(A + B\sin^2\varphi)$

	A	B	Q	ε
1	20.599	7.450	-61.801	-2.211
2	7.965	1.384	-16.928	-1.831
3	15.599	15.122	-65.621	-2.150
4	11.455	1.907	-3.642	-0.285
5	21.023	1.485	9.903	0.441
6	5.960	7.567	-41.805	-3.503
7	8.907	1.286	10.037	1.001
8	7.850	1.192	-16.696	-1.899
9	7.259	2.012	-47.660	-5.304
10	9.310	1.971	-30.270	-2.802
11	17.455	4.584	-5.467	-0.291
12	7.960	3.811	-29.438	-2.685
13	17.455	2.238	-7.188	-0.400
14	25.081	16.898	2.537	0.060
15	8.074	2.831	-36.482	-4.203
16	10.599	2.175	-34.102	-3.210
17	14.203	3.264	-0.008	-0.005
18	21.396	1.862	-8.550	-0.371
19	6.850	2.304	-4.555	-0.621
20	14.083	1.881	-23.088	-1.460
21	9.138	1.760	-3.231	-0.308
22	7.965	1.686	-34.467	-4.262
23	21.527	4.467	-6.500	-0.259
24	25.464	2.017	-7.680	-0.280
25	10.205	18.400	-42.671	-1.498
26	9.268	3.830	-49.637	-3.826
27	9.023	4.867	-38.921	-2.831
28	20.333	2.302	-27.773	-1.228
29	7.960	1.558	-27.661	-3.010
30	25.081	1.579	12.231	0.459