

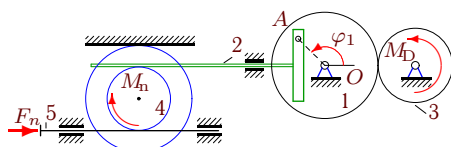
Кулиса. Уравнение Лагранжа

Кулисный механизм расположен в вертикальной плоскости и состоит из однородных цилиндров, блоков (радиус инерции i_k), штока и груза¹. Используя уравнение Лагранжа 2-го рода, получить уравнение движения механизма. Найти значение углового ускорения $\ddot{\varphi}_1$ при $t = 0$. Кинетическую энергию представить в форме $T = (\dot{\varphi}^2/2)(A + B \sin^2 \varphi)$ или $T = (\dot{\varphi}^2/2)(A + B \cos^2 \varphi)$ (варианты помечены *)

Кирсанов М.Н. **Решебник. Теоретическая механика**/Под ред. А. И. Кириллова.– М.: ФИЗМАТЛИТ, 2008. — 384 с. (с.307.)

Задача D31.1.

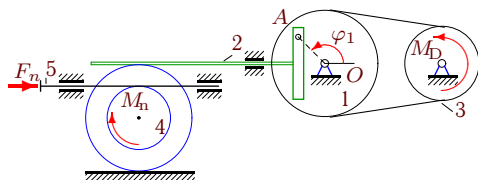
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$$\begin{aligned} M_{Dz} &= M_0 - k\omega_{3z}, \quad M_{nz} = -\mu\omega_{4z}, \\ F_{nx} &= -\nu v_{5x}, \quad \varphi_{1,0} = 1.1, \quad \omega_{1z,0} = 0.5 \frac{1}{c}, \\ M_0 &= 7 \text{ Нм}, \quad k = 15 \text{ Нмс}, \\ \nu &= 40 \text{ Нс/м}, \quad \mu = 14 \text{ Нмс}, \\ I_1 &= 4 \text{ кгм}^2, \quad m_2 = 14 \text{ кг}, \quad m_3 = 32 \text{ кг}, \\ m_4 &= 24 \text{ кг}, \quad R_1 = 38 \text{ см}, \quad r_1 = 27 \text{ см}, \\ R_3 &= 28 \text{ см}, \quad R_4 = 20 \text{ см}, \quad r_4 = 12 \text{ см}, \quad i_4 = 13 \text{ см}. \end{aligned}$$

Задача D31.2.

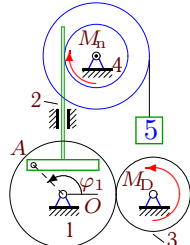
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$$\begin{aligned} M_{Dz} &= M_0 - k\omega_{3z}, \quad M_{nz} = -\mu\omega_{4z}, \\ F_{nx} &= -\nu v_{5x}, \quad \varphi_{1,0} = 1.1, \quad \omega_{1z,0} = 0.2 \frac{1}{c}, \\ M_0 &= 8 \text{ Нм}, \quad k = 12 \text{ Нмс}, \\ \nu &= 40 \text{ Нс/м}, \quad \mu = 15 \text{ Нмс}, \\ I_1 &= 5 \text{ кгм}^2, \quad m_2 = 14 \text{ кг}, \quad m_3 = 32 \text{ кг}, \\ m_4 &= 24 \text{ кг}, \quad R_1 = 35 \text{ см}, \quad r_1 = 24 \text{ см}, \\ R_3 &= 25 \text{ см}, \quad R_4 = 20 \text{ см}, \quad r_4 = 12 \text{ см}, \quad i_4 = 13 \text{ см}. \end{aligned}$$

Задача D31.3.

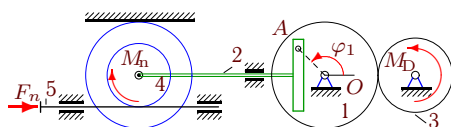
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$$\begin{aligned} M_{Dz} &= M_0 - k\omega_{3z}, \quad M_{nz} = -\mu\omega_{4z}, \\ M_0 &= 8 \text{ Нм}, \quad k = 15 \text{ Нмс}, \\ \varphi_{1,0} &= 1.2, \quad \omega_{1z,0} = 0.5 \frac{1}{c}, \\ \mu &= 13 \text{ Нмс}, \quad I_1 = 5 \text{ кгм}^2, \\ m_2 &= 15 \text{ кг}, \quad m_3 = 33 \text{ кг}, \quad m_4 = 25 \text{ кг}, \\ m_5 &= 2 \text{ кг}, \quad R_1 = 38 \text{ см}, \quad r_1 = 27 \text{ см}, \\ R_3 &= 28 \text{ см}, \quad R_4 = 20 \text{ см}, \quad r_4 = 12 \text{ см}, \quad i_4 = 14 \text{ см}. \end{aligned}$$

Задача D31.4.

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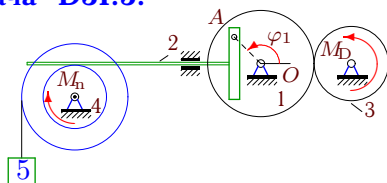


$$\begin{aligned} M_{Dz} &= M_0 - k\omega_{3z}, \quad M_{nz} = -\mu\omega_{4z}, \\ F_{nx} &= -\nu v_{5x}, \quad \varphi_{1,0} = 1.4, \quad \omega_{1z,0} = 0.1 \frac{1}{c}, \\ M_0 &= 10 \text{ Нм}, \quad k = 11 \text{ Нмс}, \\ \nu &= 25 \text{ Нс/м}, \quad \mu = 11 \text{ Нмс}, \\ I_1 &= 7 \text{ кгм}^2, \quad m_2 = 17 \text{ кг}, \quad m_3 = 35 \text{ кг}, \\ m_4 &= 27 \text{ кг}, \quad R_1 = 34 \text{ см}, \quad r_1 = 23 \text{ см}, \\ R_3 &= 24 \text{ см}, \quad R_4 = 20 \text{ см}, \quad r_4 = 12 \text{ см}, \quad i_4 = 16 \text{ см}. \end{aligned}$$

¹В некоторых вариантах содержатся не все элементы.

Задача D31.5.

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$$M_{Dz} = M_0 - k\omega_{3z}, M_{nz} = -\mu\omega_{4z},$$

$$M_0 = 9 \text{ Нм}, k = 11 \text{ Нмс},$$

$$\varphi_{1,0} = 1.3, \omega_{1z,0} = 0.1 \frac{1}{\text{с}},$$

$$\mu = 12 \text{ Нмс}, I_1 = 6 \text{ кгм}^2,$$

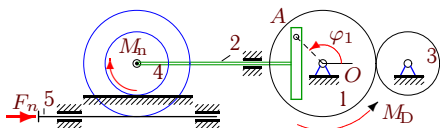
$$m_2 = 16 \text{ кг}, m_3 = 34 \text{ кг}, m_4 = 26 \text{ кг},$$

$$m_5 = 3 \text{ кг}, R_1 = 34 \text{ см}, r_1 = 23 \text{ см},$$

$$R_3 = 24 \text{ см}, R_4 = 20 \text{ см}, r_4 = 12 \text{ см}, i_4 = 15 \text{ см}.$$

Задача D31.6.

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$$M_{Dz} = M_0 - k\omega_{1z}, M_{nz} = -\mu\omega_{4z},$$

$$F_{nx} = -\nu v_{5x}, \varphi_{1,0} = 1.3, \omega_{1z,0} = 0.2 \frac{1}{\text{с}},$$

$$M_0 = 12 \text{ Нм}, k = 12 \text{ Нмс},$$

$$\nu = 8 \text{ кНс/м}, \mu = 12 \text{ Нмс},$$

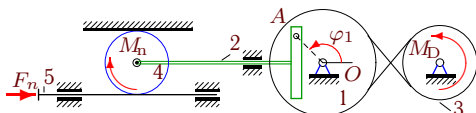
$$I_1 = 15 \text{ кгм}^2, m_2 = 16 \text{ кг}, m_3 = 34 \text{ кг},$$

$$m_4 = 26 \text{ кг}, R_1 = 35 \text{ см}, r_1 = 24 \text{ см},$$

$$R_3 = 25 \text{ см}, R_4 = 20 \text{ см}, r_4 = 12 \text{ см}, i_4 = 15 \text{ см}.$$

Задача D31.7.

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$$M_{Dz} = M_0 - k\omega_{3z}, M_{nz} = -\mu\omega_{4z},$$

$$F_{nx} = -\nu v_{5x}, \varphi_{1,0} = 1.5, \omega_{1z,0} = 0.4 \frac{1}{\text{с}},$$

$$M_0 = 13 \text{ Нм}, k = 14 \text{ Нмс},$$

$$\nu = 35 \text{ Нс/м}, \mu = 10 \text{ Нмс},$$

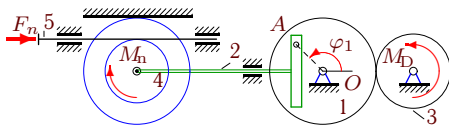
$$I_1 = 18 \text{ кгм}^2, m_2 = 18 \text{ кг}, m_3 = 36 \text{ кг},$$

$$m_4 = 28 \text{ кг}, R_1 = 37 \text{ см}, r_1 = 26 \text{ см},$$

$$R_3 = 27 \text{ см}, R_4 = 12 \text{ см}.$$

Задача D31.8.

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$$M_{Dz} = M_0 - k\omega_{3z}, M_{nz} = -\mu\omega_{4z},$$

$$F_{nx} = -\nu v_{5x}, \varphi_{1,0} = 1.2, \omega_{1z,0} = 0.4 \frac{1}{\text{с}},$$

$$M_0 = 8 \text{ Нм}, k = 14 \text{ Нмс},$$

$$\nu = 8 \text{ кНс/м}, \mu = 14 \text{ Нмс},$$

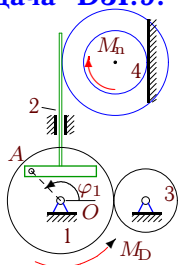
$$I_1 = 5 \text{ кгм}^2, m_2 = 15 \text{ кг}, m_3 = 33 \text{ кг},$$

$$m_4 = 25 \text{ кг}, R_1 = 37 \text{ см}, r_1 = 26 \text{ см},$$

$$R_3 = 27 \text{ см}, R_4 = 20 \text{ см}, r_4 = 12 \text{ см}, i_4 = 14 \text{ см}.$$

Задача D31.9.

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$$M_{Dz} = M_0 - k\omega_{1z}, M_{nz} = -\mu\omega_{4z},$$

$$\varphi_{1,0} = 1.1, \omega_{1z,0} = 0.3 \frac{1}{\text{с}},$$

$$M_0 = 10 \text{ Нм}, k = 13 \text{ Нмс},$$

$$\mu = 15 \text{ Нмс},$$

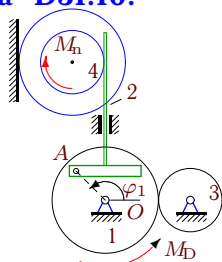
$$I_1 = 7 \text{ кгм}^2, m_2 = 14 \text{ кг}, m_3 = 32 \text{ кг},$$

$$m_4 = 24 \text{ кг}, R_1 = 36 \text{ см}, r_1 = 25 \text{ см},$$

$$R_3 = 26 \text{ см}, R_4 = 20 \text{ см}, r_4 = 12 \text{ см}, i_4 = 13 \text{ см}.$$

Задача D31.10.

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$$M_{Dz} = M_0 - k\omega_{1z}, M_{nz} = -\mu\omega_{4z},$$

$$\varphi_{1,0} = 1.1, \omega_{1z,0} = 0.2 \frac{1}{\text{с}},$$

$$M_0 = 10 \text{ Нм}, k = 12 \text{ Нмс},$$

$$\mu = 14 \text{ Нмс},$$

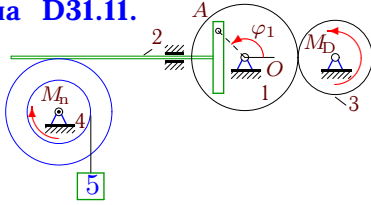
$$I_1 = 7 \text{ кгм}^2, m_2 = 14 \text{ кг}, m_3 = 32 \text{ кг},$$

$$m_4 = 24 \text{ кг}, R_1 = 35 \text{ см}, r_1 = 24 \text{ см},$$

$$R_3 = 25 \text{ см}, R_4 = 20 \text{ см}, r_4 = 12 \text{ см}, i_4 = 13 \text{ см}.$$

Задача D31.11.

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$$M_{Dz} = M_0 - k\omega_{3z}, M_{nz} = -\mu\omega_{4z},$$

$$M_0 = 7 \text{ Нм}, k = 14 \text{ Нм/с},$$

$$\varphi_{1,0} = 1.1, \omega_{1z,0} = 0.4 \frac{1}{\text{с}},$$

$$\mu = 15 \text{ Нм/с}, I_1 = 4 \text{ кгм}^2,$$

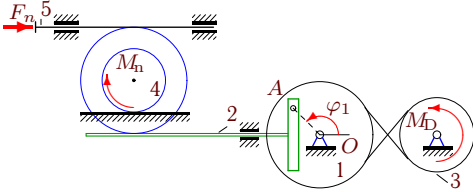
$$m_2 = 14 \text{ кг}, m_3 = 32 \text{ кг}, m_4 = 24 \text{ кг},$$

$$m_5 = 2 \text{ кг}, R_1 = 37 \text{ см}, r_1 = 26 \text{ см},$$

$$R_3 = 27 \text{ см}, R_4 = 20 \text{ см}, r_4 = 12 \text{ см}, i_4 = 13 \text{ см}.$$

Задача D31.12.

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$$M_{Dz} = M_0 - k\omega_{3z}, M_{nz} = -\mu\omega_{4z},$$

$$F_{nx} = -\nu v_{5x}, \varphi_{1,0} = 1.3, \omega_{1z,0} = 0.2 \frac{1}{\text{с}},$$

$$M_0 = 11 \text{ Нм}, k = 12 \text{ Нм/с},$$

$$\nu = 30 \text{ Нс/м}, \mu = 13 \text{ Нм/с},$$

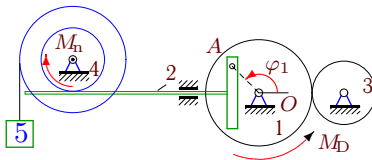
$$I_1 = 12 \text{ кгм}^2, m_2 = 16 \text{ кг}, m_3 = 34 \text{ кг},$$

$$m_4 = 26 \text{ кг}, R_1 = 35 \text{ см}, r_1 = 24 \text{ см},$$

$$R_3 = 25 \text{ см}, R_4 = 20 \text{ см}, r_4 = 12 \text{ см}, i_4 = 15 \text{ см}.$$

Задача D31.13.

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$$M_{Dz} = M_0 - k\omega_{1z}, M_{nz} = -\mu\omega_{4z},$$

$$M_0 = 13 \text{ Нм}, k = 12 \text{ Нм/с},$$

$$\varphi_{1,0} = 1.4, \omega_{1z,0} = 0.2 \frac{1}{\text{с}},$$

$$\mu = 11 \text{ Нм/с}, I_1 = 19 \text{ кгм}^2,$$

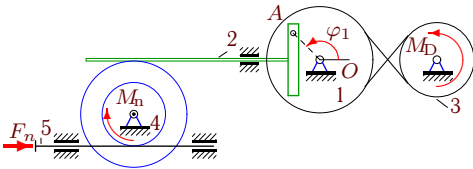
$$m_2 = 17 \text{ кг}, m_3 = 35 \text{ кг}, m_4 = 27 \text{ кг},$$

$$m_5 = 7 \text{ кг}, R_1 = 35 \text{ см}, r_1 = 24 \text{ см},$$

$$R_3 = 25 \text{ см}, R_4 = 20 \text{ см}, r_4 = 12 \text{ см}, i_4 = 16 \text{ см}.$$

Задача D31.14.

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$$M_{Dz} = M_0 - k\omega_{3z}, M_{nz} = -\mu\omega_{4z},$$

$$F_{nx} = -\nu v_{5x}, \varphi_{1,0} = 1.5, \omega_{1z,0} = 0.2 \frac{1}{\text{с}},$$

$$M_0 = 13 \text{ Нм}, k = 12 \text{ Нм/с},$$

$$\nu = 8 \text{ Нс/м}, \mu = 10 \text{ Нм/с},$$

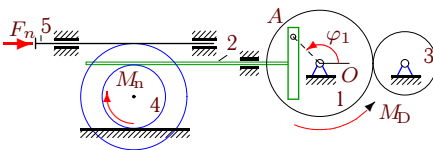
$$I_1 = 18 \text{ кгм}^2, m_2 = 18 \text{ кг}, m_3 = 36 \text{ кг},$$

$$m_4 = 28 \text{ кг}, R_1 = 35 \text{ см}, r_1 = 24 \text{ см},$$

$$R_3 = 25 \text{ см}, R_4 = 20 \text{ см}, r_4 = 12 \text{ см}, i_4 = 17 \text{ см}.$$

Задача D31.15.

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$$M_{Dz} = M_0 - k\omega_{1z}, M_{nz} = -\mu\omega_{4z},$$

$$F_{nx} = -\nu v_{5x}, \varphi_{1,0} = 1.4, \omega_{1z,0} = 0.4 \frac{1}{\text{с}},$$

$$M_0 = 13 \text{ Нм}, k = 14 \text{ Нм/с},$$

$$\nu = 25 \text{ Нс/м}, \mu = 12 \text{ Нм/с},$$

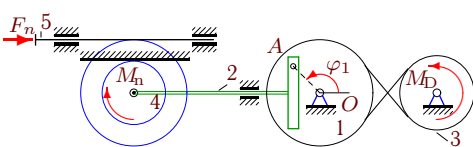
$$I_1 = 19 \text{ кгм}^2, m_2 = 17 \text{ кг}, m_3 = 35 \text{ кг},$$

$$m_4 = 27 \text{ кг}, R_1 = 37 \text{ см}, r_1 = 26 \text{ см},$$

$$R_3 = 27 \text{ см}, R_4 = 20 \text{ см}, r_4 = 12 \text{ см}, i_4 = 16 \text{ см}.$$

Задача D31.16.

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$$M_{Dz} = M_0 - k\omega_{3z}, M_{nz} = -\mu\omega_{4z},$$

$$F_{nx} = -\nu v_{5x}, \varphi_{1,0} = 1.3, \omega_{1z,0} = 0.5 \frac{1}{\text{с}},$$

$$M_0 = 11 \text{ Нм}, k = 15 \text{ Нм/с},$$

$$\nu = 8 \text{ Нс/м}, \mu = 13 \text{ Нм/с},$$

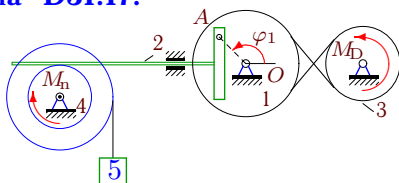
$$I_1 = 12 \text{ кгм}^2, m_2 = 16 \text{ кг}, m_3 = 34 \text{ кг},$$

$$m_4 = 26 \text{ кг}, R_1 = 38 \text{ см}, r_1 = 27 \text{ см},$$

$$R_3 = 28 \text{ см}, R_4 = 20 \text{ см}, r_4 = 12 \text{ см}, i_4 = 15 \text{ см}.$$

Задача D31.17.

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$$M_{Dz} = M_0 - k\omega_{3z}, M_{nz} = -\mu\omega_{4z},$$

$$M_0 = 10 \text{ Нм}, k = 11 \text{ Нмс},$$

$$\varphi_{1,0} = 1.2, \omega_{1z,0} = 0.1 \frac{1}{\text{с}},$$

$$\mu = 13 \text{ Нмс}, I_1 = 9 \text{ кгм}^2,$$

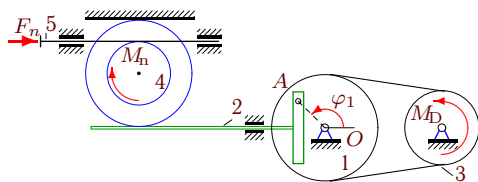
$$m_2 = 15 \text{ кг}, m_3 = 33 \text{ кг}, m_4 = 25 \text{ кг},$$

$$m_5 = 4 \text{ кг}, R_1 = 34 \text{ см}, r_1 = 23 \text{ см},$$

$$R_3 = 24 \text{ см}, R_4 = 20 \text{ см}, r_4 = 12 \text{ см}, i_4 = 14 \text{ см}.$$

Задача D31.18.

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$$M_{Dz} = M_0 - k\omega_{3z}, M_{nz} = -\mu\omega_{4z},$$

$$F_{nx} = -\nu v_{5x}, \varphi_{1,0} = 1.5, \omega_{1z,0} = 0.3 \frac{1}{\text{с}},$$

$$M_0 = 12 \text{ Нм}, k = 13 \text{ Нмс},$$

$$\nu = 8 \text{ кНс/м}, \mu = 11 \text{ Нмс},$$

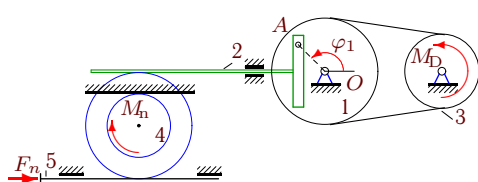
$$I_1 = 13 \text{ кгм}^2, m_2 = 18 \text{ кг}, m_3 = 36 \text{ кг},$$

$$m_4 = 28 \text{ кг}, R_1 = 36 \text{ см}, r_1 = 25 \text{ см},$$

$$R_3 = 26 \text{ см}, R_4 = 20 \text{ см}, r_4 = 12 \text{ см}, i_4 = 17 \text{ см}.$$

Задача D31.19.

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$$M_{Dz} = M_0 - k\omega_{3z}, M_{nz} = -\mu\omega_{4z},$$

$$F_{nx} = -\nu v_{5x}, \varphi_{1,0} = 1.2, \omega_{1z,0} = 0.2 \frac{1}{\text{с}},$$

$$M_0 = 9 \text{ Нм}, k = 12 \text{ Нмс},$$

$$\nu = 35 \text{ Нс/м}, \mu = 14 \text{ Нмс},$$

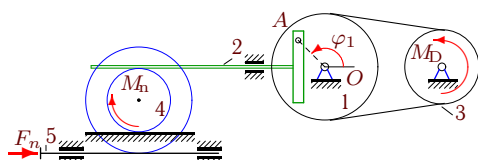
$$I_1 = 7 \text{ кгм}^2, m_2 = 15 \text{ кг}, m_3 = 33 \text{ кг},$$

$$m_4 = 25 \text{ кг}, R_1 = 35 \text{ см}, r_1 = 24 \text{ см},$$

$$R_3 = 25 \text{ см}, R_4 = 20 \text{ см}, r_4 = 12 \text{ см}, i_4 = 14 \text{ см}.$$

Задача D31.20.

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$$M_{Dz} = M_0 - k\omega_{3z}, M_{nz} = -\mu\omega_{4z},$$

$$F_{nx} = -\nu v_{5x}, \varphi_{1,0} = 1.3, \omega_{1z,0} = 0.1 \frac{1}{\text{с}},$$

$$M_0 = 10 \text{ Нм}, k = 11 \text{ Нмс},$$

$$\nu = 8 \text{ кНс/м}, \mu = 12 \text{ Нмс},$$

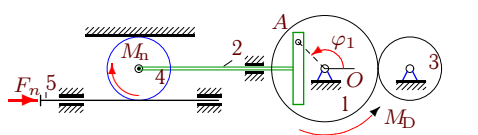
$$I_1 = 9 \text{ кгм}^2, m_2 = 16 \text{ кг}, m_3 = 34 \text{ кг},$$

$$m_4 = 26 \text{ кг}, R_1 = 34 \text{ см}, r_1 = 23 \text{ см},$$

$$R_3 = 24 \text{ см}, R_4 = 20 \text{ см}, r_4 = 12 \text{ см}, i_4 = 15 \text{ см}.$$

Задача D31.21.

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$$M_{Dz} = M_0 - k\omega_{1z}, M_{nz} = -\mu\omega_{4z},$$

$$F_{nx} = -\nu v_{5x}, \varphi_{1,0} = 1.4, \omega_{1z,0} = 0.4 \frac{1}{\text{с}},$$

$$M_0 = 13 \text{ Нм}, k = 14 \text{ Нмс},$$

$$\nu = 40 \text{ Нс/м}, \mu = 11 \text{ Нмс},$$

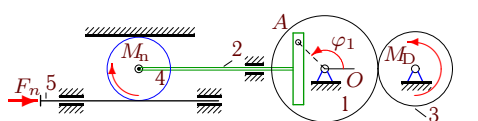
$$I_1 = 19 \text{ кгм}^2, m_2 = 17 \text{ кг}, m_3 = 35 \text{ кг},$$

$$m_4 = 27 \text{ кг}, R_1 = 37 \text{ см}, r_1 = 26 \text{ см},$$

$$R_3 = 27 \text{ см}, R_4 = 12 \text{ см}.$$

Задача D31.22.

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$$M_{Dz} = M_0 - k\omega_{3z}, M_{nz} = -\mu\omega_{4z},$$

$$F_{nx} = -\nu v_{5x}, \varphi_{1,0} = 1.2, \omega_{1z,0} = 0.3 \frac{1}{\text{с}},$$

$$M_0 = 8 \text{ Нм}, k = 13 \text{ Нмс},$$

$$\nu = 50 \text{ Нс/м}, \mu = 13 \text{ Нмс},$$

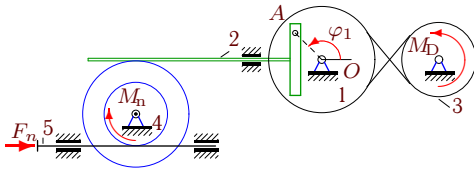
$$I_1 = 5 \text{ кгм}^2, m_2 = 15 \text{ кг}, m_3 = 33 \text{ кг},$$

$$m_4 = 25 \text{ кг}, R_1 = 36 \text{ см}, r_1 = 25 \text{ см},$$

$$R_3 = 26 \text{ см}, R_4 = 12 \text{ см}.$$

Задача D31.23.

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$$M_{Dz} = M_0 - k\omega_{3z}, M_{nz} = -\mu\omega_{4z},$$

$$F_{nx} = -\nu v_{5x}, \varphi_{1,0} = 1.3, \omega_{1z,0} = 0.5 \frac{1}{c},$$

$$M_0 = 11 \text{ Нм}, k = 15 \text{ Нмс},$$

$$\nu = 8 \text{ кНс/м}, \mu = 12 \text{ Нмс},$$

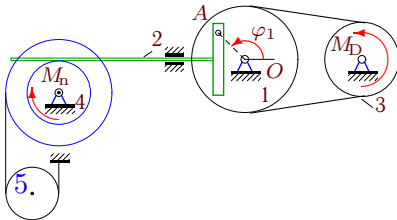
$$I_1 = 12 \text{ кгм}^2, m_2 = 16 \text{ кг}, m_3 = 34 \text{ кг},$$

$$m_4 = 26 \text{ кг}, R_1 = 38 \text{ см}, r_1 = 27 \text{ см},$$

$$R_3 = 28 \text{ см}, R_4 = 20 \text{ см}, r_4 = 12 \text{ см}, i_4 = 15 \text{ см}.$$

Задача D31.24.

10



$$M_{Dz} = M_0 - k\omega_{3z}, M_{nz} = -\mu\omega_{4z},$$

$$M_0 = 11 \text{ Нм}, k = 14 \text{ Нмс},$$

$$\varphi_{1,0} = 1.4, \omega_{1z,0} = 0.4 \frac{1}{c},$$

$$\mu = 11 \text{ Нмс}, I_1 = 11 \text{ кгм}^2,$$

$$m_2 = 17 \text{ кг}, m_3 = 35 \text{ кг}, m_4 = 27 \text{ кг},$$

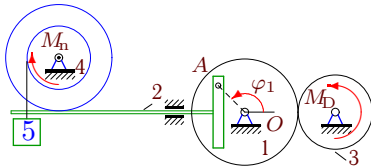
$$m_5 = 5 \text{ кг}, R_1 = 37 \text{ см}, r_1 = 26 \text{ см},$$

$$R_3 = 27 \text{ см}, R_4 = 20 \text{ см}, r_4 = 12 \text{ см}, i_4 = 16 \text{ см},$$

$$r_5 = 11 \text{ см}.$$

Задача D31.25.

10



$$M_{Dz} = M_0 - k\omega_{3z}, M_{nz} = -\mu\omega_{4z},$$

$$M_0 = 7 \text{ Нм}, k = 11 \text{ Нмс},$$

$$\varphi_{1,0} = 1.1, \omega_{1z,0} = 0.1 \frac{1}{c},$$

$$\mu = 15 \text{ Нмс}, I_1 = 4 \text{ кгм}^2,$$

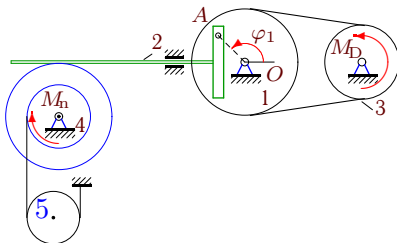
$$m_2 = 14 \text{ кг}, m_3 = 32 \text{ кг}, m_4 = 24 \text{ кг},$$

$$m_5 = 2 \text{ кг}, R_1 = 34 \text{ см}, r_1 = 23 \text{ см},$$

$$R_3 = 24 \text{ см}, R_4 = 20 \text{ см}, r_4 = 12 \text{ см}, i_4 = 13 \text{ см}.$$

Задача D31.26.

10



$$M_{Dz} = M_0 - k\omega_{3z}, M_{nz} = -\mu\omega_{4z},$$

$$M_0 = 9 \text{ Нм}, k = 14 \text{ Нмс},$$

$$\varphi_{1,0} = 1.2, \omega_{1z,0} = 0.4 \frac{1}{c},$$

$$\mu = 14 \text{ Нмс}, I_1 = 7 \text{ кгм}^2,$$

$$m_2 = 15 \text{ кг}, m_3 = 33 \text{ кг}, m_4 = 25 \text{ кг},$$

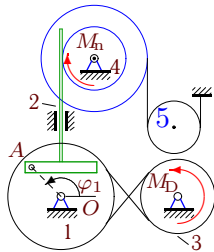
$$m_5 = 4 \text{ кг}, R_1 = 37 \text{ см}, r_1 = 26 \text{ см},$$

$$R_3 = 27 \text{ см}, R_4 = 20 \text{ см}, r_4 = 12 \text{ см}, i_4 = 14 \text{ см},$$

$$r_5 = 11 \text{ см}.$$

Задача D31.27.

10



$$M_{Dz} = M_0 - k\omega_{3z}, M_{nz} = -\mu\omega_{4z},$$

$$M_0 = 10 \text{ Нм}, k = 15 \text{ Нмс},$$

$$\varphi_{1,0} = 1.2, \omega_{1z,0} = 0.5 \frac{1}{c},$$

$$\mu = 13 \text{ Нмс}, I_1 = 9 \text{ кгм}^2,$$

$$m_2 = 15 \text{ кг}, m_3 = 33 \text{ кг}, m_4 = 25 \text{ кг},$$

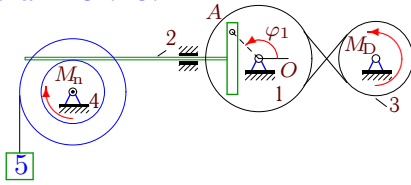
$$m_5 = 4 \text{ кг}, R_1 = 38 \text{ см}, r_1 = 27 \text{ см},$$

$$R_3 = 28 \text{ см}, R_4 = 20 \text{ см}, r_4 = 12 \text{ см}, i_4 = 14 \text{ см},$$

$$r_5 = 12 \text{ см}.$$

Задача D31.28.

10



$$M_{Dz} = M_0 - k\omega_{3z}, M_{nz} = -\mu\omega_{4z},$$

$$M_0 = 13 \text{ Нм}, k = 14 \text{ Нмс},$$

$$\varphi_{1,0} = 1.5, \omega_{1z,0} = 0.4 \frac{1}{c},$$

$$\mu = 10 \text{ Нмс}, I_1 = 18 \text{ кгм}^2,$$

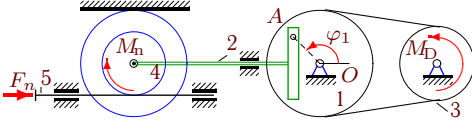
$$m_2 = 18 \text{ кг}, m_3 = 36 \text{ кг}, m_4 = 28 \text{ кг},$$

$$m_5 = 7 \text{ кг}, R_1 = 37 \text{ см}, r_1 = 26 \text{ см},$$

$$R_3 = 27 \text{ см}, R_4 = 20 \text{ см}, r_4 = 12 \text{ см}, i_4 = 17 \text{ см}.$$

Задача D31.29.

10



$$M_{Dz} = M_0 - k\omega_{3z}, M_{nz} = -\mu\omega_{4z},$$

$$F_{nx} = -\nu v_{5x}, \varphi_{1,0} = 1.4, \omega_{1z,0} = 0.5 \frac{1}{c},$$

$$M_0 = 11 \text{ Нм}, k = 15 \text{ Нмс},$$

$$\nu = 25 \text{ Нс/м}, \mu = 11 \text{ Нмс},$$

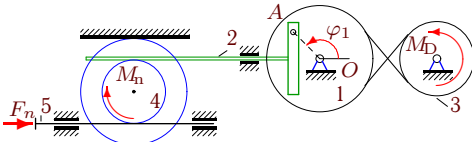
$$I_1 = 11 \text{ кгм}^2, m_2 = 17 \text{ кг}, m_3 = 35 \text{ кг},$$

$$m_4 = 27 \text{ кг}, R_1 = 38 \text{ см}, r_1 = 27 \text{ см},$$

$$R_3 = 28 \text{ см}, R_4 = 20 \text{ см}, r_4 = 12 \text{ см}, i_4 = 16 \text{ см}.$$

Задача D31.30.

10



$$M_{Dz} = M_0 - k\omega_{3z}, M_{nz} = -\mu\omega_{4z},$$

$$F_{nx} = -\nu v_{5x}, \varphi_{1,0} = 1.5, \omega_{1z,0} = 0.4 \frac{1}{c},$$

$$M_0 = 13 \text{ Нм}, k = 14 \text{ Нмс},$$

$$\nu = 20 \text{ Нс/м}, \mu = 10 \text{ Нмс},$$

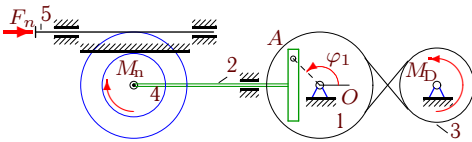
$$I_1 = 18 \text{ кгм}^2, m_2 = 18 \text{ кг}, m_3 = 36 \text{ кг},$$

$$m_4 = 28 \text{ кг}, R_1 = 37 \text{ см}, r_1 = 26 \text{ см},$$

$$R_3 = 27 \text{ см}, R_4 = 20 \text{ см}, r_4 = 12 \text{ см}, i_4 = 17 \text{ см}.$$

Задача D31.31.

10



$$M_{Dz} = M_0 - k\omega_{3z}, M_{nz} = -\mu\omega_{4z},$$

$$F_{nx} = -\nu v_{5x}, \varphi_{1,0} = 1.1, \omega_{1z,0} = 0.2 \frac{1}{c},$$

$$M_0 = 9 \text{ Нм}, k = 12 \text{ Нмс},$$

$$\nu = 8 \text{ Нс/м}, \mu = 15 \text{ Нмс},$$

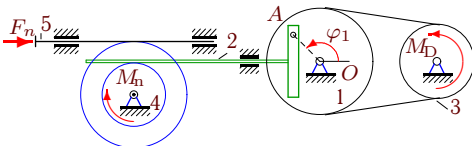
$$I_1 = 6 \text{ кгм}^2, m_2 = 14 \text{ кг}, m_3 = 32 \text{ кг},$$

$$m_4 = 24 \text{ кг}, R_1 = 35 \text{ см}, r_1 = 24 \text{ см},$$

$$R_3 = 25 \text{ см}, R_4 = 20 \text{ см}, r_4 = 12 \text{ см}, i_4 = 13 \text{ см}.$$

Задача D31.32.

10



$$M_{Dz} = M_0 - k\omega_{3z}, M_{nz} = -\mu\omega_{4z},$$

$$F_{nx} = -\nu v_{5x}, \varphi_{1,0} = 1.1, \omega_{1z,0} = 0.4 \frac{1}{c},$$

$$M_0 = 8 \text{ Нм}, k = 14 \text{ Нмс},$$

$$\nu = 40 \text{ Нс/м}, \mu = 15 \text{ Нмс},$$

$$I_1 = 5 \text{ кгм}^2, m_2 = 14 \text{ кг}, m_3 = 32 \text{ кг},$$

$$m_4 = 24 \text{ кг}, R_1 = 37 \text{ см}, r_1 = 26 \text{ см},$$

$$R_3 = 27 \text{ см}, R_4 = 20 \text{ см}, r_4 = 12 \text{ см}, i_4 = 13 \text{ см}.$$

	A	B	Q	ε	B_2	B_4	B_5	Q_F	Q_M	Q_D	Q_T
1	6.310	16.576	-105.171	-5.486	1.02	15.56	0.00	-18.53	-63.33	-23.31	0.00
2	6.960	1.298	5.404	0.674	0.81	0.49	0.00	-0.23	-0.86	6.50	0.00
3*	7.383	3.979	-40.189	-5.041	1.09	2.48	0.41	0.00	-4.32	-24.67	-11.20
4	9.023	3.242	-18.116	-1.489	0.90	2.34	0.00	-0.33	-1.41	-16.37	0.00
5	7.965	3.436	-8.180	-0.734	0.85	2.15	0.44	0.00	-4.09	-14.96	10.87
6	17.082	4.759	-37.342	-1.739	0.92	3.84	0.00	-38.03	-8.91	9.60	0.00
7	20.464	4.056	-50.782	-2.075	1.22	2.84	0.00	-3.77	-18.68	-28.33	0.00
8	7.259	3.532	-59.767	-5.806	1.01	2.52	0.00	-30.07	-8.22	-21.48	0.00
9*	9.074	1.333	-20.051	-2.140	0.88	0.46	0.00	0.00	-0.57	6.10	-25.59
10*	8.960	1.575	-23.695	-2.549	0.81	0.77	0.00	0.00	-0.32	7.60	-30.97
11	6.190	1.681	-30.890	-4.119	0.95	0.69	0.05	0.00	-8.05	-20.11	-2.73
12	14.083	9.556	-46.964	-2.050	0.92	8.63	0.00	-5.13	-21.73	-20.10	0.00
13	21.144	4.864	-25.014	-0.968	0.98	2.76	1.12	0.00	-8.55	10.60	-27.07
14	20.205	2.202	-58.781	-2.625	1.04	1.17	0.00	-33.01	-2.87	-22.90	0.00
15	21.396	2.417	0.762	0.029	1.15	1.27	0.00	-1.17	-5.47	7.40	0.00
16	14.455	6.023	-179.620	-8.979	1.17	4.86	0.00	-120.33	-30.55	-28.74	0.00
17	10.907	3.181	-34.543	-2.527	0.79	1.80	0.59	0.00	-4.15	-16.37	-14.02
18	15.333	1.879	1.886	0.109	1.13	0.75	0.00	-5.97	-1.28	9.14	0.00
19	9.021	8.514	-19.599	-1.201	0.86	7.65	0.00	-5.60	-21.89	7.90	0.00
20	10.965	1.728	6.570	0.522	0.85	0.88	0.00	-4.37	-1.02	11.96	0.00
21	21.396	3.887	-16.860	-0.674	1.15	2.74	0.00	-4.20	-20.06	7.40	0.00
22	7.138	3.281	-36.516	-3.666	0.94	2.34	0.00	-3.26	-14.70	-18.55	0.00
23	14.455	2.233	-136.359	-8.259	1.17	1.07	0.00	-97.46	-10.15	-28.74	0.00
24	13.396	4.746	-5.028	-0.286	1.15	3.24	0.35	0.00	-20.06	4.56	10.47
25	5.850	1.315	-16.113	-2.338	0.74	0.54	0.04	0.00	-1.58	-12.12	-2.41
26	9.259	1.879	-3.552	-0.335	1.01	0.83	0.04	0.00	-8.22	1.82	2.85
27*	11.383	3.878	-42.903	-3.580	1.09	2.48	0.30	0.00	-4.32	-27.39	-11.20
28	20.464	6.330	-17.332	-0.650	1.22	3.80	1.31	0.00	-18.68	-28.33	29.68
29	13.527	4.467	-10.885	-0.620	1.24	3.23	0.00	-2.27	-9.73	1.11	0.00
30	20.464	21.594	-78.979	-1.889	1.22	20.38	0.00	-8.61	-42.04	-28.33	0.00
31	7.960	3.811	-59.368	-5.409	0.81	3.00	0.00	-32.53	-9.53	-17.30	0.00
32	7.190	2.850	-24.311	-2.591	0.95	1.90	0.00	-2.39	-22.37	0.45	0.00