

## Уравнение Лагранжа 2-го рода

Механическая система с идеальными стационарными связями имеет две степени свободы и движется под действием сил тяжести. Три элемента механизма наделены массами, кратными некоторой массе  $m$ . Трением пренебречь. Подвижные и неподвижные блоки считать однородными цилиндрами. Найти ускорение груза  $A$  или центра цилиндра  $A$ .

В таблице ответов даны коэффициенты дифференциальных уравнений движения системы и искомое ускорение. Система (после сокращения на  $m$ ) имеет вид

$$\begin{aligned} a_{11}\ddot{x}_1 + a_{12}\ddot{x}_2 &= Q_1, \\ a_{21}\ddot{x}_1 + a_{22}\ddot{x}_2 &= Q_2. \end{aligned}$$

В качестве обобщенных координат  $x_1, x_2$  взяты линейные перемещения точек ободов цилиндров с неподвижными осями. Координата  $x_1 > 0$  соответствует повороту левого цилиндра по часовой стрелке,  $x_2 > 0$  — повороту правого цилиндра против часовой стрелки. Коэффициенты  $a_{ij}$  — безразмерные,  $Q_1, Q_2$  и  $W_A$  — в  $\text{м/с}^2$ .

Кирсанов М.Н. **Решебник. Теоретическая механика**/Под ред. А. И. Кириллова. — М.: ФИЗМАТЛИТ, 2008. — 384 с. (с.300.)

**Задача 14.1.** 7

$m_B=6m, m_A=5m, m_C=7m,$

**Задача 14.2.** 7

$m_B=4m, m_A=2m, m_C=5m,$

**Задача 14.3.** 7

$m_B=6m, m_A=4m, m_C=4m,$

**Задача 14.4.** 7

$m_B=6m, m_A=4m, m_C=7m,$

**Задача 14.5.** 7

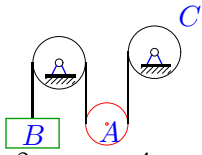
$m_B=3m, m_C=5m, m_A=4m,$

**Задача 14.6.** 7

$m_B=7m, m_A=5m, m_C=8m,$

**Задача 14.7.**

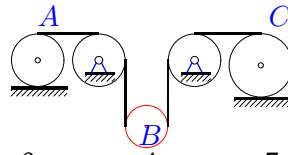
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$m_B=3m, m_A=4m, m_C=7m,$

**Задача 14.8.**

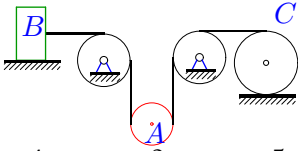
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$m_A=6m, m_B=4m, m_C=7m,$

**Задача 14.9.**

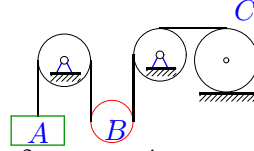
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$m_B=4m, m_A=2m, m_C=5m,$

**Задача 14.10.**

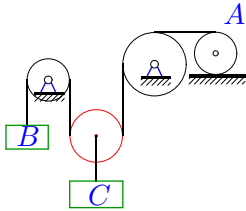
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$m_A=3m, m_B=4m, m_C=7m,$

**Задача 14.11.**

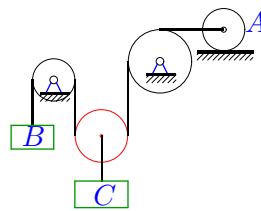
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$m_B=3m, m_C=4m, m_A=6m,$

**Задача 14.12.**

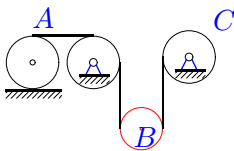
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$m_B=2m, m_C=3m, m_A=5m,$

**Задача 14.13.**

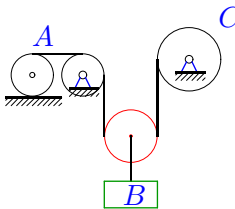
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$m_A=4m, m_B=2m, m_C=5m,$

**Задача 14.14.**

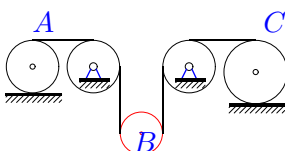
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$m_A=3m, m_B=2m, m_C=4m,$

**Задача 14.15.**

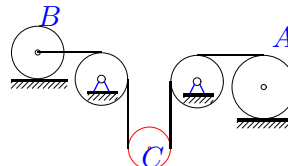
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$m_A=4m, m_B=2m, m_C=5m,$

**Задача 14.16.**

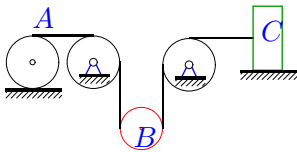
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$m_B=6m, m_C=4m, m_A=7m,$

**Задача 14.17.**

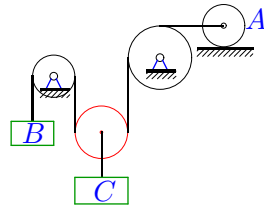
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$m_A=6m, m_B=4m, m_C=7m,$

**Задача 14.18.**

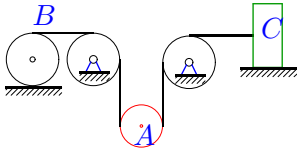
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$m_B=3m, m_C=4m, m_A=6m,$

**Задача 14.19.**

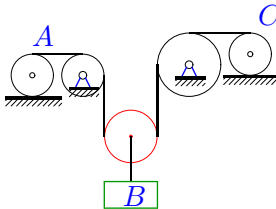
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$m_B=7m, m_A=5m, m_C=8m,$

**Задача 14.20.**

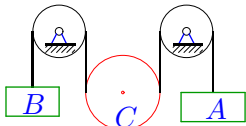
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$m_A=3m, m_B=2m, m_C=4m,$

**Задача 14.21.**

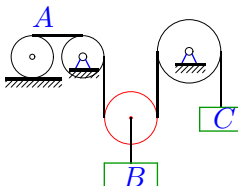
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$m_B=3m, m_C=4m, m_A=4m,$

**Задача 14.22.**

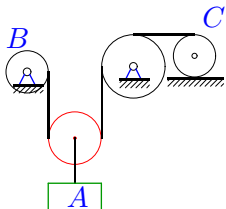
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$m_A=5m, m_B=4m, m_C=4m,$

**Задача 14.23.**

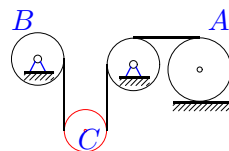
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$m_B=5m, m_A=4m, m_C=6m,$

**Задача 14.24.**

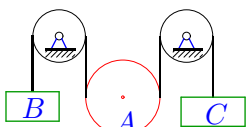
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$m_B=4m, m_C=2m, m_A=5m,$

**Задача 14.25.**

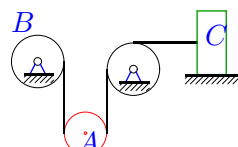
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$m_B=3m, m_A=5m, m_C=4m,$

**Задача 14.26.**

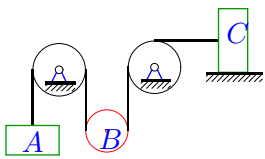
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$m_B=5m, m_A=3m, m_C=6m,$

**Задача 14.27.**

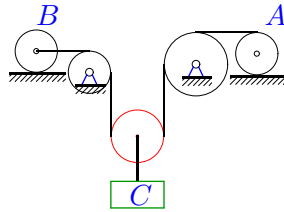
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$m_A=2m, m_B=2m, m_C=5m,$

**Задача 14.28.**

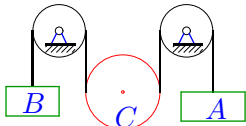
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$m_B=3m, m_C=2m, m_A=4m,$

**Задача 14.29.**

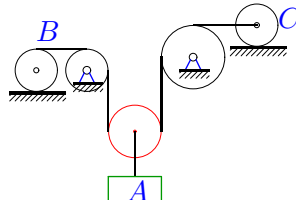
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$m_B=3m, m_C=5m, m_A=4m,$

**Задача 14.30.**

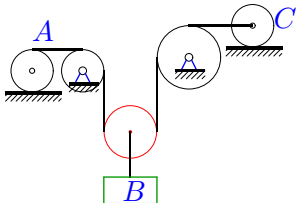
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$m_B=3m, m_A=2m, m_C=4m,$

**Задача 14.31.**

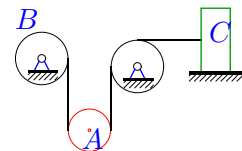
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$m_A=3m, m_B=2m, m_C=4m,$

**Задача 14.32.**

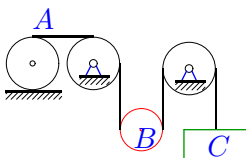
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$m_B=4m, m_A=2m, m_C=5m,$

**Задача 14.33.**

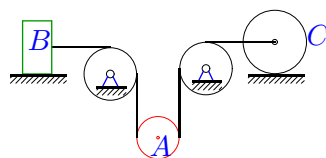
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$m_A=4m, m_B=2m, m_C=3m,$

**Задача 14.34.**

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$m_B=7m, m_A=5m, m_C=8m,$

**Уравнение Лагранжа 2-го рода**

| №  | $a_{11}$ | $a_{12}$ | $a_{22}$ | $Q_1$  | $Q_2$   | $W_A$   |
|----|----------|----------|----------|--------|---------|---------|
| 1  | 3.500    | 1.250    | 8.250    | 24.525 | 24.525  | 4.1530  |
| 2  | 2.750    | 0.250    | 5.750    | 9.810  | 9.810   | 2.4914  |
| 3  | 10.500   | 0.500    | 5.500    | 19.620 | -19.620 | -0.8530 |
| 4  | 10.500   | 0.500    | 12.000   | 19.620 | 19.620  | 1.6773  |
| 5  | 4.875    | 0.625    | 5.875    | -4.905 | -14.715 | -2.4308 |
| 6  | 5.375    | 0.625    | 9.875    | 24.525 | 24.525  | 3.2584  |
| 7  | 4.500    | 0.500    | 5.000    | -9.810 | 19.620  | 0.7716  |
| 8  | 3.750    | 0.500    | 4.125    | 19.620 | 19.620  | 2.3367  |
| 9  | 4.750    | 0.250    | 2.625    | 9.810  | 9.810   | 2.7181  |
| 10 | 4.500    | 0.500    | 4.125    | -9.810 | 19.620  | -2.7455 |
| 11 | 4.000    | 1.000    | 3.250    | -9.810 | 19.620  | 3.6787  |
| 12 | 2.750    | 0.750    | 8.250    | -4.905 | 14.715  | 1.9953  |
| 13 | 2.250    | 0.250    | 3.250    | 9.810  | 9.810   | 2.0297  |
| 14 | 1.625    | 0.500    | 2.500    | 9.810  | 9.810   | 2.5731  |
| 15 | 2.250    | 0.250    | 2.625    | 9.810  | 9.810   | 1.9935  |
| 16 | 10.500   | 0.500    | 4.125    | 19.620 | 19.620  | 2.2781  |
| 17 | 3.750    | 0.500    | 8.500    | 19.620 | 19.620  | 2.4816  |
| 18 | 4.000    | 1.000    | 10.000   | -9.810 | 19.620  | 2.2638  |
| 19 | 4.500    | 0.625    | 9.875    | 24.525 | 24.525  | 3.6540  |
| 20 | 1.625    | 0.500    | 2.000    | 9.810  | 9.810   | 2.4525  |
| 21 | 4.500    | 0.500    | 5.500    | -9.810 | -19.620 | -3.4035 |
| 22 | 2.875    | 1.000    | 5.000    | 19.620 | -19.620 | 4.4007  |
| 23 | 3.500    | 1.000    | 3.250    | 19.620 | 19.620  | 4.4913  |
| 24 | 2.750    | 0.250    | 2.625    | 9.810  | 9.810   | 1.7135  |
| 25 | 4.875    | 0.625    | 5.875    | -4.905 | -14.715 | -1.5627 |
| 26 | 3.625    | 0.375    | 7.125    | 14.715 | 14.715  | 2.8642  |
| 27 | 2.750    | 0.250    | 5.750    | -9.810 | 9.810   | -3.7371 |
| 28 | 5.000    | 0.500    | 2.000    | 9.810  | 9.810   | 2.2638  |
| 29 | 4.875    | 0.625    | 5.875    | -4.905 | -14.715 | -2.4308 |
| 30 | 1.625    | 0.500    | 6.500    | 9.810  | 9.810   | 3.3889  |
| 31 | 1.625    | 0.500    | 6.500    | 9.810  | 9.810   | 2.8538  |
| 32 | 2.750    | 0.250    | 5.750    | 9.810  | 9.810   | 2.4914  |
| 33 | 2.250    | 0.250    | 3.750    | 9.810  | -19.620 | 2.4891  |
| 34 | 8.875    | 0.625    | 13.875   | 24.525 | 24.525  | 2.1478  |