

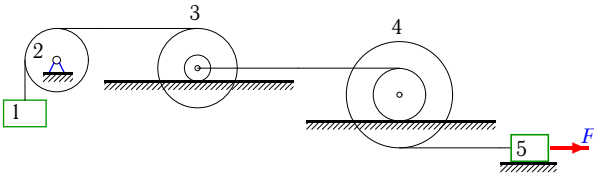
Кинетическая энергия системы. Приведенные массы

Механическая система, состоящая из пяти тел 1, 2, 3, 4 и 5, движется под действием внешних сил. Заданы радиусы цилиндров и блоков. Радиусы инерции ρ даны для блоков, цилиндры считать однородными. Горизонтальный стержень, находящийся в зацеплении с блоками, считать невесомым. Массы даны в килограммах, радиусы — в сантиметрах. Вычислить приведенную массу системы μ в формуле $T = \mu v_1^2/2$, где v_1 — скорость груза 1 (или центра цилиндра 1).

Кирсанов М.Н. Задачи по теоретической механике с решениями в **Maple** 11. — М.: ФИЗМАТЛИТ, 2010. — 264 с. (с.111)

Задача D-33.1.

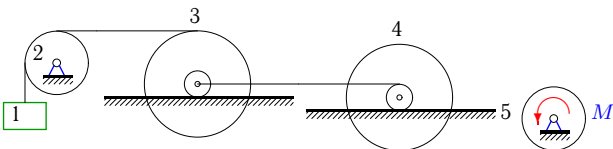
11



$$\begin{aligned} R_3 &= 3, \quad r_3 = 1, \quad \rho_3 = 2, \\ R_4 &= 4, \quad r_4 = 2, \quad \rho_4 = 3, \\ m_1 &= 18, \quad m_2 = 4, \\ m_3 &= 64, \quad m_4 = 256, \\ m_5 &= 128. \end{aligned}$$

Задача D-33.2.

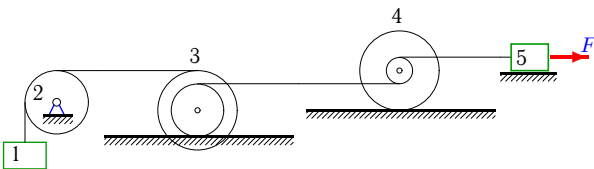
11



$$\begin{aligned} R_3 &= 4, \quad r_3 = 1, \quad \rho_3 = 3, \\ R_4 &= 4, \quad r_4 = 1, \quad \rho_4 = 3, \\ m_1 &= 18, \quad m_2 = 6, \\ m_3 &= 20, \quad m_4 = 30, \\ m_5 &= 200. \end{aligned}$$

Задача D-33.3.

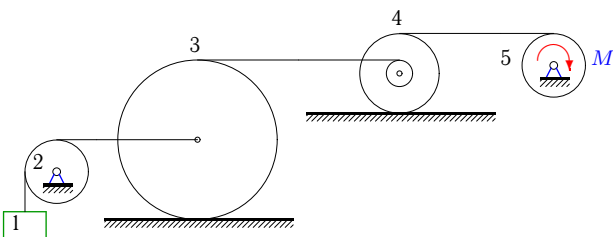
11



$$\begin{aligned} R_3 &= 3, \quad r_3 = 2, \quad \rho_3 = 2, \\ R_4 &= 3, \quad r_4 = 1, \quad \rho_4 = 2, \\ m_1 &= 12, \quad m_2 = 4, \\ m_3 &= 100, \quad m_4 = 75, \\ m_5 &= 50. \end{aligned}$$

Задача D-33.4.

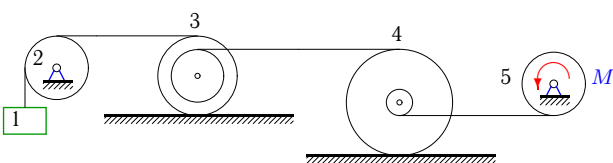
11



$$\begin{aligned} R_3 &= 6, \\ R_4 &= 3, \quad r_4 = 1, \quad \rho_4 = 2, \\ m_1 &= 5, \quad m_2 = 4, \\ m_3 &= 8, \quad m_4 = 12, \\ m_5 &= 4. \end{aligned}$$

Задача D-33.5.

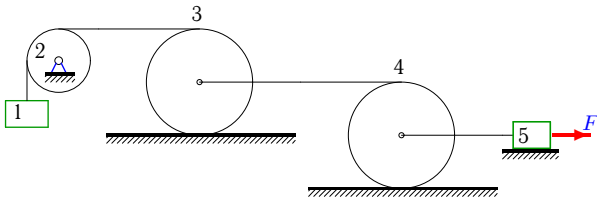
11



$$\begin{aligned} R_3 &= 3, \quad r_3 = 2, \quad \rho_3 = 2, \\ R_4 &= 4, \quad r_4 = 1, \quad \rho_4 = 3, \\ m_1 &= 4, \quad m_2 = 8, \\ m_3 &= 144, \quad m_4 = 2304, \\ m_5 &= 512. \end{aligned}$$

Задача D-33.6.

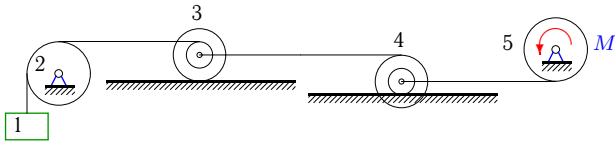
11



$$\begin{aligned}
 R_3 &= 4, \\
 R_4 &= 4, \\
 m_1 &= 11, \quad m_2 = 8, \\
 m_3 &= 64, \quad m_4 = 224, \\
 m_5 &= 96.
 \end{aligned}$$

Задача D-33.7.

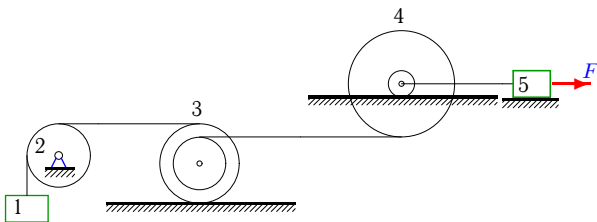
11



$$\begin{aligned}
 R_3 &= 2, \quad r_3 = 1, \quad \rho_3 = 1, \\
 R_4 &= 2, \quad r_4 = 1, \quad \rho_4 = 1, \\
 m_1 &= 12, \quad m_2 = 12, \\
 m_3 &= 36, \quad m_4 = 243, \\
 m_5 &= 162.
 \end{aligned}$$

Задача D-33.8.

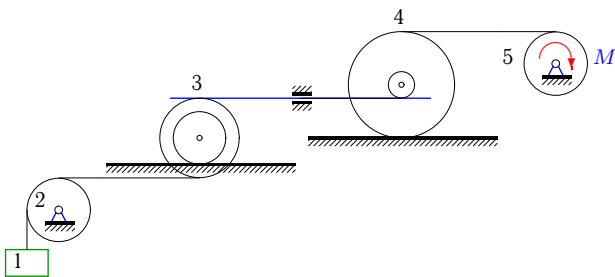
11



$$\begin{aligned}
 R_3 &= 3, \quad r_3 = 2, \quad \rho_3 = 2, \\
 R_4 &= 4, \quad r_4 = 1, \quad \rho_4 = 3, \\
 m_1 &= 11, \quad m_2 = 8, \\
 m_3 &= 144, \quad m_4 = 162, \\
 m_5 &= 324.
 \end{aligned}$$

Задача D-33.9.

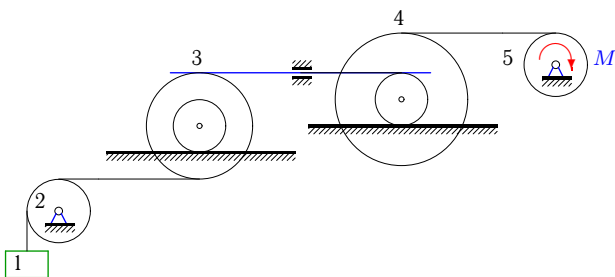
11



$$\begin{aligned}
 R_3 &= 3, \quad r_3 = 2, \quad \rho_3 = 2, \\
 R_4 &= 4, \quad r_4 = 1, \quad \rho_4 = 3, \\
 m_1 &= 11, \quad m_2 = 6, \\
 m_3 &= 4, \quad m_4 = 9, \\
 m_5 &= 18.
 \end{aligned}$$

Задача D-33.10.

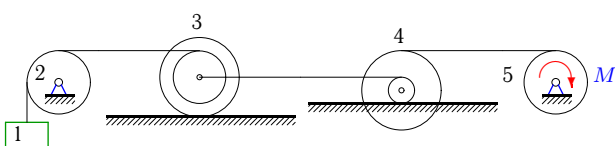
11



$$\begin{aligned}
 R_3 &= 4, \quad r_3 = 2, \quad \rho_3 = 3, \\
 R_4 &= 5, \quad r_4 = 2, \quad \rho_4 = 4, \\
 m_1 &= 15, \quad m_2 = 8, \\
 m_3 &= 16, \quad m_4 = 12, \\
 m_5 &= 32.
 \end{aligned}$$

Задача D-33.11.

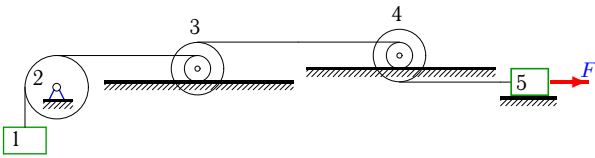
11



$$\begin{aligned}
 R_3 &= 3, \quad r_3 = 2, \quad \rho_3 = 2, \\
 R_4 &= 3, \quad r_4 = 1, \quad \rho_4 = 2, \\
 m_1 &= 11, \quad m_2 = 4, \\
 m_3 &= 100, \quad m_4 = 60, \\
 m_5 &= 100.
 \end{aligned}$$

Задача D-33.12.

11



$$R_3 = 2, r_3 = 1, \rho_3 = 1,$$

$$R_4 = 2, r_4 = 1, \rho_4 = 1,$$

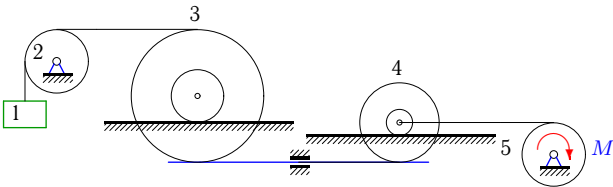
$$m_1 = 21, m_2 = 2,$$

$$m_3 = 16, m_4 = 56,$$

$$m_5 = 96.$$

Задача D-33.13.

11



$$R_3 = 5, r_3 = 2, \rho_3 = 4,$$

$$R_4 = 3, r_4 = 1, \rho_4 = 2,$$

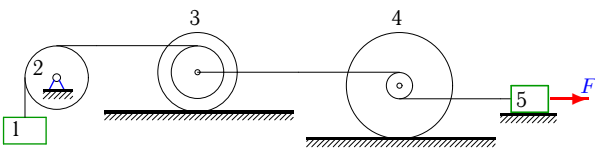
$$m_1 = 18, m_2 = 10,$$

$$m_3 = 196, m_4 = 196,$$

$$m_5 = 392.$$

Задача D-33.14.

11



$$R_3 = 3, r_3 = 2, \rho_3 = 2,$$

$$R_4 = 4, r_4 = 1, \rho_4 = 3,$$

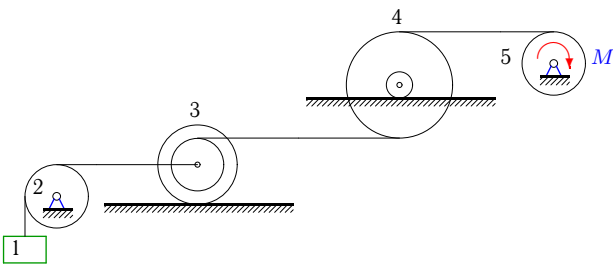
$$m_1 = 10, m_2 = 8,$$

$$m_3 = 100, m_4 = 75,$$

$$m_5 = 625.$$

Задача D-33.15.

11



$$R_3 = 3, r_3 = 2, \rho_3 = 2,$$

$$R_4 = 4, r_4 = 1, \rho_4 = 3,$$

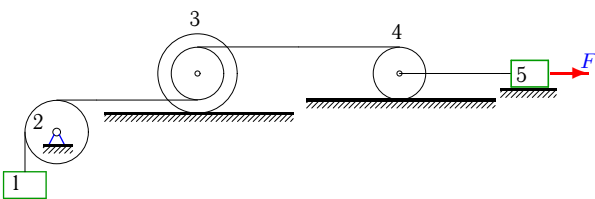
$$m_1 = 13, m_2 = 6,$$

$$m_3 = 36, m_4 = 81,$$

$$m_5 = 162.$$

Задача D-33.16.

11



$$R_3 = 3, r_3 = 2, \rho_3 = 2,$$

$$R_4 = 2,$$

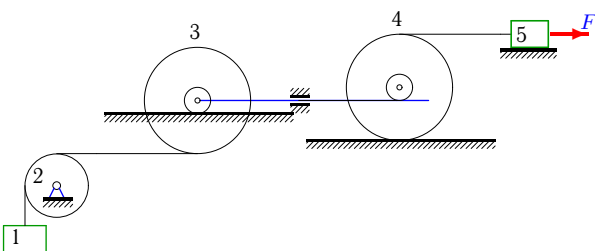
$$m_1 = 9, m_2 = 12,$$

$$m_3 = 4, m_4 = 24,$$

$$m_5 = 8.$$

Задача D-33.17.

11



$$R_3 = 4, r_3 = 1, \rho_3 = 3,$$

$$R_4 = 4, r_4 = 1, \rho_4 = 3,$$

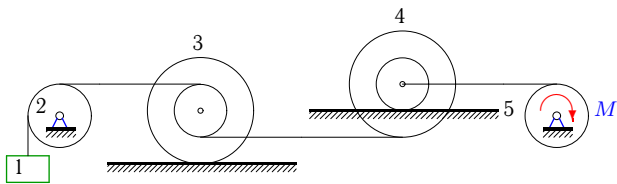
$$m_1 = 12, m_2 = 6,$$

$$m_3 = 36, m_4 = 243,$$

$$m_5 = 162.$$

Задача D-33.18.

11



$$R_3 = 4, r_3 = 2, \rho_3 = 3,$$

$$R_4 = 4, r_4 = 2, \rho_4 = 3,$$

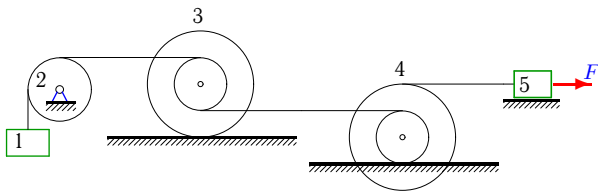
$$m_1 = 15, m_2 = 10,$$

$$m_3 = 144, m_4 = 108,$$

$$m_5 = 36.$$

Задача D-33.19.

11



$$R_3 = 4, r_3 = 2, \rho_3 = 3,$$

$$R_4 = 4, r_4 = 2, \rho_4 = 3,$$

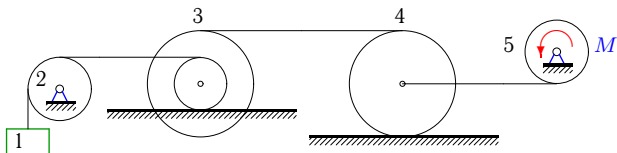
$$m_1 = 12, m_2 = 4,$$

$$m_3 = 144, m_4 = 144,$$

$$m_5 = 8.$$

Задача D-33.20.

11



$$R_3 = 4, r_3 = 2, \rho_3 = 3,$$

$$R_4 = 4,$$

$$m_1 = 13, m_2 = 12,$$

$$m_3 = 112, m_4 = 192,$$

$$m_5 = 160.$$

D-33

Ответы.

Кинетическая энергия системы. Приведенные массы 05.12.2013

№	μ_1	μ_2	μ_3	μ_4	μ_5	$\sum_{k=1}^5 \mu_k$
1	18	2	20	13	2	55
2	18	3	8	3	9	41
3	12	2	32	156	128	330
4	5	2	12	39	18	76
5	4	4	52	625	25	710
6	11	4	24	21	6	66
7	12	6	20	24	4	66
8	11	4	52	125	25	217
9	11	3	32	625	1600	2271
10	15	4	52	135	441	647
11	11	2	52	27	72	164
12	21	1	8	63	54	147
13	18	5	80	45	9	157
14	10	4	52	27	81	174
15	13	3	52	250	625	943
16	9	6	52	225	50	342
17	12	3	40	75	128	258
18	15	5	100	39	2	161
19	12	2	100	13	2	129
20	13	6	91	162	45	317

D-33 файл о33d11A