

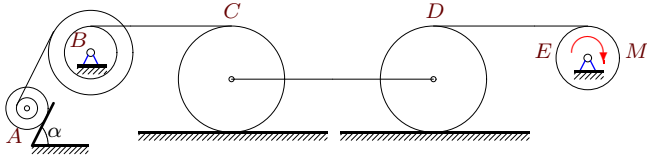
## Кинетическая энергия системы. Приведенные массы

Механическая система, состоящая из пяти тел  $A, B, C, D$  и  $E$ , движется под действием внешних сил. Заданы радиусы цилиндров и блоков. Радиусы инерции 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  $\mu$  в формуле  $T = \mu v_A^2/2$ , где  $v_A$  — скорость груза  $A$  (или центра цилиндра  $A$ ).

Кирсанов М.Н. **Решбник. Теоретическая механика**/Под ред. А. И. Кириллова.— М.: ФИЗМАТЛИТ, 2008. — 384 с. (с.257.)

### Задача D33.1.

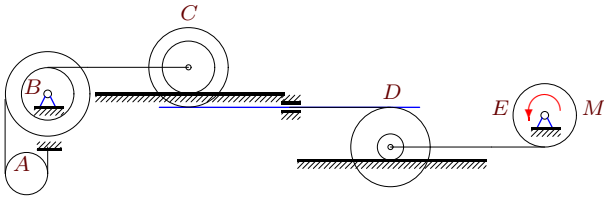
5



$$\begin{aligned} R_A &= 2, r_A = 1, i_A = 1, \\ R_B &= 3, r_B = 2, i_B = 3, \\ R_C &= 4, \\ R_D &= 4, \\ m_A &= 20, m_B = 20, \\ m_C &= 64, m_D = 56, \\ m_E &= 12. \end{aligned}$$

### Задача D33.2.

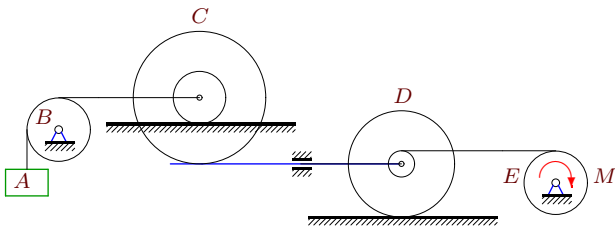
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$$\begin{aligned} R_B &= 4, r_B = 2, i_B = 2, \\ R_C &= 3, r_C = 2, i_C = 2, \\ R_D &= 3, r_D = 1, i_D = 2, \\ m_A &= 2, m_B = 8, \\ m_C &= 4, m_D = 192, \\ m_E &= 128. \end{aligned}$$

### Задача D33.3.

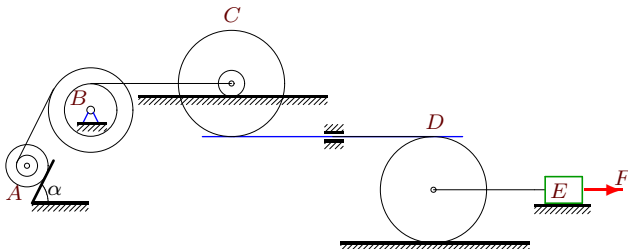
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$$\begin{aligned} R_C &= 5, r_C = 2, i_C = 4, \\ R_D &= 4, r_D = 1, i_D = 3, \\ m_A &= 17, m_B = 8, \\ m_C &= 7, m_D = 64, \\ m_E &= 128. \end{aligned}$$

### Задача D33.4.

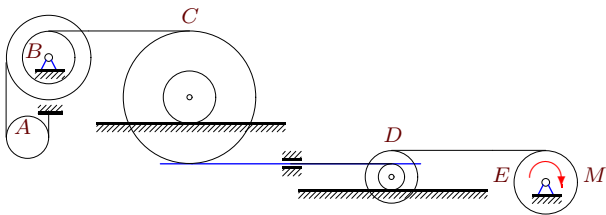
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$$\begin{aligned} R_A &= 2, r_A = 1, i_A = 1, \\ R_B &= 3, r_B = 2, i_B = 3, \\ R_C &= 4, r_C = 1, i_C = 3, \\ R_D &= 4, \\ m_A &= 12, m_B = 16, \\ m_C &= 6, m_D = 40, \\ m_E &= 16. \end{aligned}$$

**Задача D33.5.**

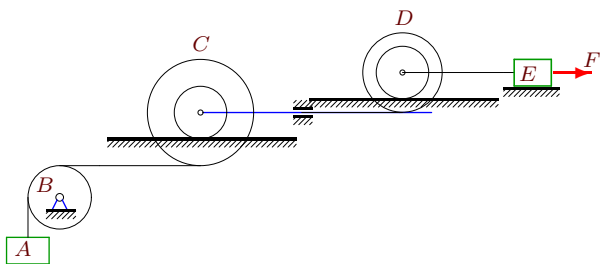
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$$\begin{aligned}
 R_B &= 4, r_B = 2, i_B = 2, \\
 R_C &= 5, r_C = 2, i_C = 4, \\
 R_D &= 2, r_D = 1, i_D = 1, \\
 m_A &= 6, m_B = 24, \\
 m_C &= 294, m_D = 490, \\
 m_E &= 392.
 \end{aligned}$$

**Задача D33.6.**

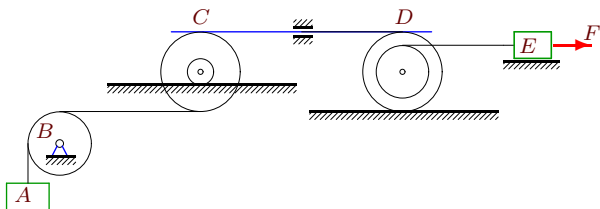
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$$\begin{aligned}
 R_C &= 4, r_C = 2, i_C = 3, \\
 R_D &= 3, r_D = 2, i_D = 2, \\
 m_A &= 19, m_B = 12, \\
 m_C &= 16, m_D = 3, \\
 m_E &= 2.
 \end{aligned}$$

**Задача D33.7.**

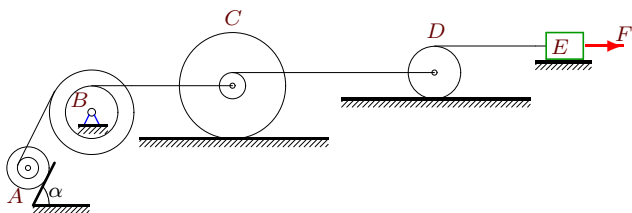
5



$$\begin{aligned}
 R_C &= 3, r_C = 1, i_C = 2, \\
 R_D &= 3, r_D = 2, i_D = 2, \\
 m_A &= 13, m_B = 2, \\
 m_C &= 28, m_D = 54, \\
 m_E &= 45.
 \end{aligned}$$

**Задача D33.8.**

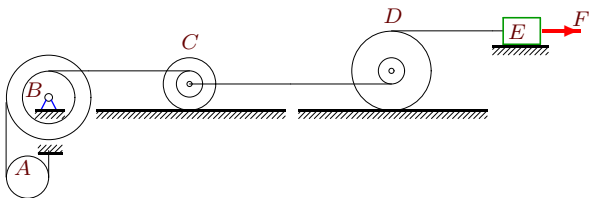
5



$$\begin{aligned}
 R_A &= 2, r_A = 1, i_A = 1, \\
 R_B &= 3, r_B = 2, i_B = 3, \\
 R_C &= 4, r_C = 1, i_C = 3, \\
 R_D &= 2, \\
 m_A &= 12, m_B = 24, \\
 m_C &= 96, m_D = 160, \\
 m_E &= 16.
 \end{aligned}$$

**Задача D33.9.**

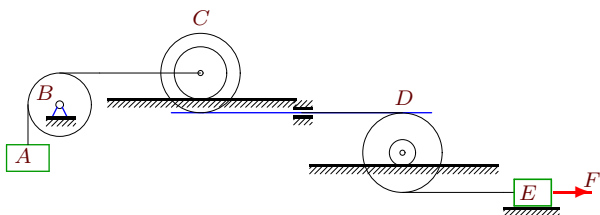
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$$\begin{aligned}
 R_B &= 4, r_B = 2, i_B = 3, \\
 R_C &= 2, r_C = 1, i_C = 1, \\
 R_D &= 3, r_D = 1, i_D = 2, \\
 m_A &= 2, m_B = 20, \\
 m_C &= 36, m_D = 27, \\
 m_E &= 2.
 \end{aligned}$$

**Задача D33.10.**

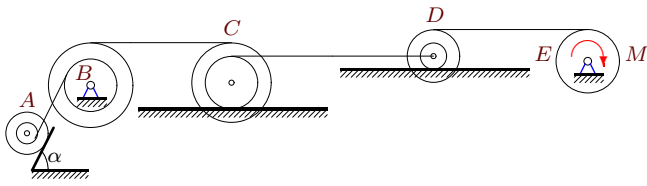
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$$\begin{aligned}
 R_C &= 3, r_C = 2, i_C = 2, \\
 R_D &= 3, r_D = 1, i_D = 2, \\
 m_A &= 21, m_B = 4, \\
 m_C &= 7, m_D = 384, \\
 m_E &= 80.
 \end{aligned}$$

**Задача D33.11.**

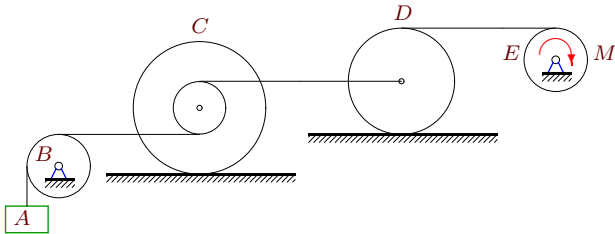
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$$\begin{aligned}
 R_A &= 2, r_A = 1, i_A = 2, \\
 R_B &= 4, r_B = 2, i_B = 2, \\
 R_C &= 3, r_C = 2, i_C = 2, \\
 R_D &= 2, r_D = 1, i_D = 1, \\
 m_A &= 16, m_B = 16, \\
 m_C &= 175, m_D = 150, \\
 m_E &= 50.
 \end{aligned}$$

**Задача D33.12.**

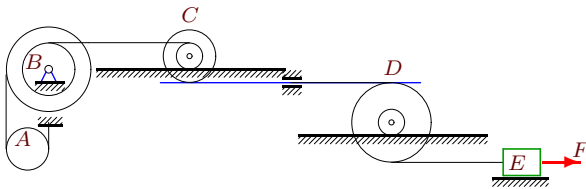
5



$$\begin{aligned}
 R_C &= 5, r_C = 2, i_C = 4, \\
 R_D &= 4, \\
 m_A &= 12, m_B = 4, \\
 m_C &= 63, m_D = 36, \\
 m_E &= 18.
 \end{aligned}$$

**Задача D33.13.**

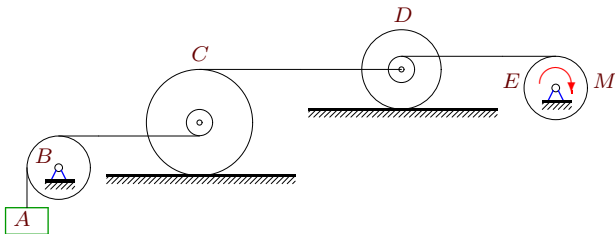
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$$\begin{aligned}
 R_B &= 4, r_B = 2, i_B = 2, \\
 R_C &= 2, r_C = 1, i_C = 1, \\
 R_D &= 3, r_D = 1, i_D = 2, \\
 m_A &= 2, m_B = 20, \\
 m_C &= 8, m_D = 192, \\
 m_E &= 32.
 \end{aligned}$$

**Задача D33.14.**

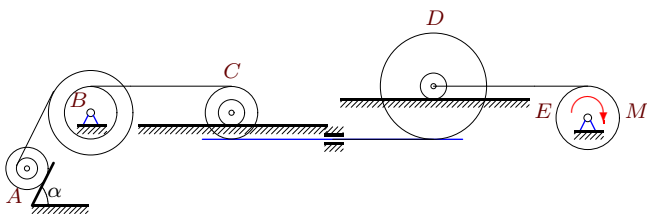
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$$\begin{aligned}
 R_C &= 4, r_C = 1, i_C = 3, \\
 R_D &= 3, r_D = 1, i_D = 2, \\
 m_A &= 11, m_B = 10, \\
 m_C &= 72, m_D = 81, \\
 m_E &= 162.
 \end{aligned}$$

**Задача D33.15.**

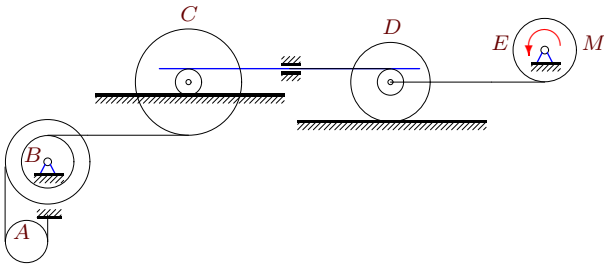
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$$\begin{aligned}
 R_A &= 2, r_A = 1, i_A = 2, \\
 R_B &= 3, r_B = 2, i_B = 2, \\
 R_C &= 2, r_C = 1, i_C = 1, \\
 R_D &= 4, r_D = 1, i_D = 3, \\
 m_A &= 16, m_B = 12, \\
 m_C &= 63, m_D = 486, \\
 m_E &= 162.
 \end{aligned}$$

Задача D33.16.

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$$R_B = 4, r_B = 2, i_B = 3,$$

$$R_C = 4, r_C = 1, i_C = 3,$$

$$R_D = 3, r_D = 1, i_D = 2,$$

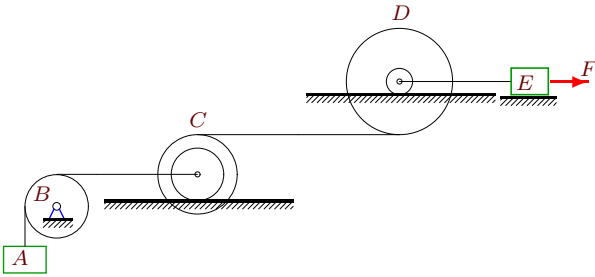
$$m_A = 6, m_B = 8,$$

$$m_C = 54, m_D = 180,$$

$$m_E = 32.$$

Задача D33.17.

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$$R_C = 3, r_C = 2, i_C = 2,$$

$$R_D = 4, r_D = 1, i_D = 3,$$

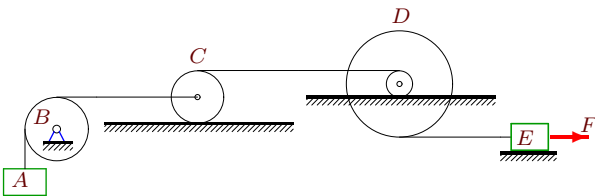
$$m_A = 18, m_B = 8,$$

$$m_C = 5, m_D = 18,$$

$$m_E = 108.$$

Задача D33.18.

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$$R_C = 2,$$

$$R_D = 4, r_D = 1, i_D = 3,$$

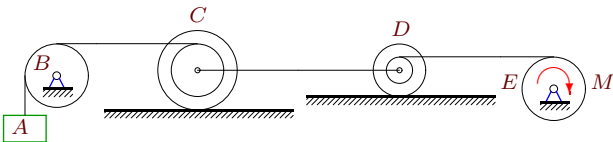
$$m_A = 18, m_B = 8,$$

$$m_C = 16, m_D = 7,$$

$$m_E = 6.$$

Задача D33.19.

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$$R_C = 3, r_C = 2, i_C = 2,$$

$$R_D = 2, r_D = 1, i_D = 1,$$

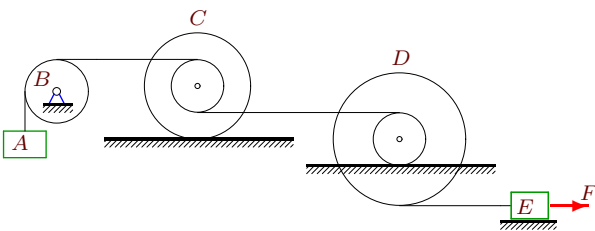
$$m_A = 10, m_B = 12,$$

$$m_C = 125, m_D = 80,$$

$$m_E = 200.$$

Задача D33.20.

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$$R_C = 4, r_C = 2, i_C = 3,$$

$$R_D = 5, r_D = 2, i_D = 4,$$

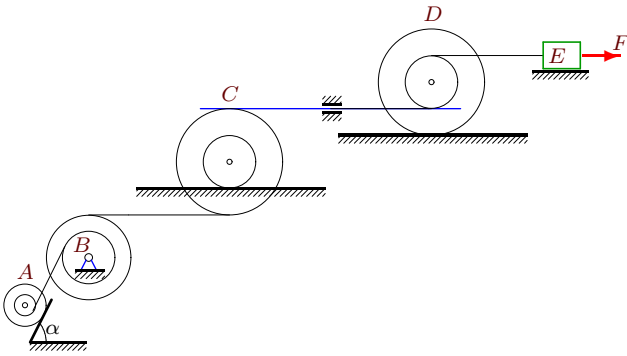
$$m_A = 20, m_B = 8,$$

$$m_C = 288, m_D = 252,$$

$$m_E = 96.$$

Задача D33.21.

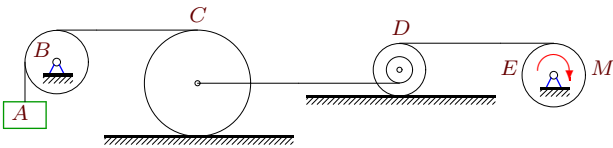
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$$\begin{aligned}
 R_A &= 2, r_A = 1, i_A = 1, \\
 R_B &= 4, r_B = 2, i_B = 3, \\
 R_C &= 4, r_C = 2, i_C = 3, \\
 R_D &= 4, r_D = 2, i_D = 3, \\
 m_A &= 12, m_B = 32, \\
 m_C &= 24, m_D = 4, \\
 m_E &= 4.
 \end{aligned}$$

Задача D33.22.

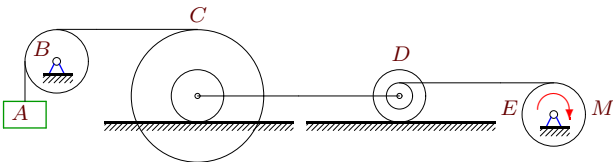
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$$\begin{aligned}
 R_C &= 4, \\
 R_D &= 2, r_D = 1, i_D = 1, \\
 m_A &= 7, m_B = 2, \\
 m_C &= 40, m_D = 16, \\
 m_E &= 6.
 \end{aligned}$$

Задача D33.23.

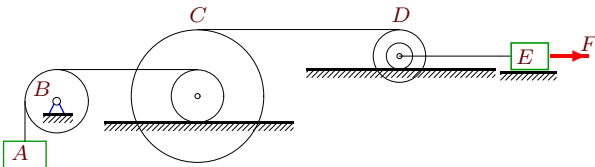
5



$$\begin{aligned}
 R_C &= 5, r_C = 2, i_C = 4, \\
 R_D &= 2, r_D = 1, i_D = 1, \\
 m_A &= 12, m_B = 12, \\
 m_C &= 196, m_D = 147, \\
 m_E &= 196.
 \end{aligned}$$

Задача D33.24.

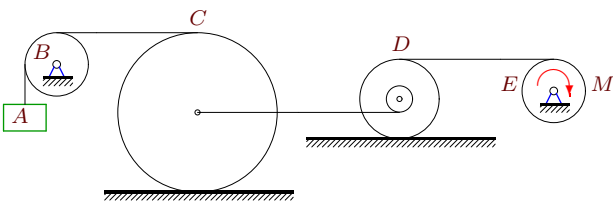
5



$$\begin{aligned}
 R_C &= 5, r_C = 2, i_C = 4, \\
 R_D &= 2, r_D = 1, i_D = 1, \\
 m_A &= 15, m_B = 12, \\
 m_C &= 20, m_D = 288, \\
 m_E &= 144.
 \end{aligned}$$

Задача D33.25.

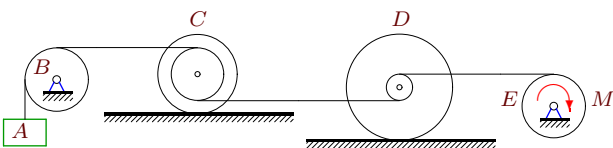
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$$\begin{aligned}
 R_C &= 6, \\
 R_D &= 3, r_D = 1, i_D = 2, \\
 m_A &= 9, m_B = 4, \\
 m_C &= 56, m_D = 96, \\
 m_E &= 40.
 \end{aligned}$$

Задача D33.26.

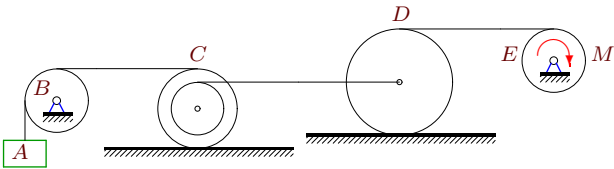
5



$$\begin{aligned}
 R_C &= 3, r_C = 2, i_C = 2, \\
 R_D &= 4, r_D = 1, i_D = 3, \\
 m_A &= 15, m_B = 8, \\
 m_C &= 200, m_D = 63, \\
 m_E &= 108.
 \end{aligned}$$

**Задача D33.27.**

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$$R_C = 3, r_C = 2, i_C = 2,$$

$$R_D = 4,$$

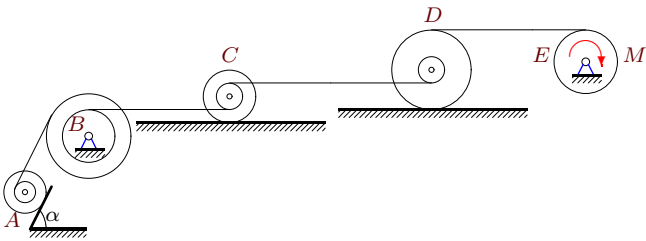
$$m_A = 8, m_B = 10,$$

$$m_C = 252, m_D = 144,$$

$$m_E = 90.$$

**Задача D33.28.**

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$$R_A = 2, r_A = 1, i_A = 2,$$

$$R_B = 3, r_B = 2, i_B = 3,$$

$$R_C = 2, r_C = 1, i_C = 1,$$

$$R_D = 3, r_D = 1, i_D = 2,$$

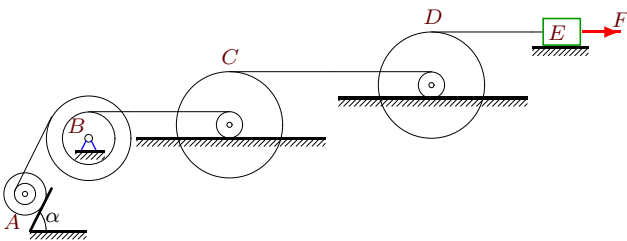
$$m_A = 20, m_B = 20,$$

$$m_C = 8, m_D = 28,$$

$$m_E = 12.$$

**Задача D33.29.**

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$$R_A = 2, r_A = 1, i_A = 1,$$

$$R_B = 3, r_B = 2, i_B = 2,$$

$$R_C = 4, r_C = 1, i_C = 3,$$

$$R_D = 4, r_D = 1, i_D = 3,$$

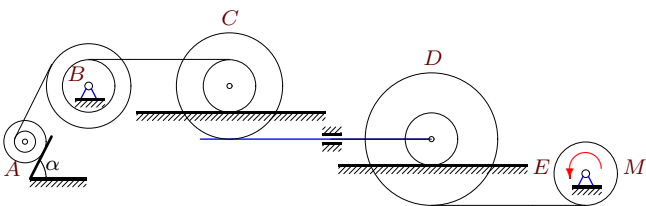
$$m_A = 16, m_B = 12,$$

$$m_C = 14, m_D = 8,$$

$$m_E = 16.$$

**Задача D33.30.**

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$$R_A = 2, r_A = 1, i_A = 1,$$

$$R_B = 3, r_B = 2, i_B = 2,$$

$$R_C = 4, r_C = 2, i_C = 3,$$

$$R_D = 5, r_D = 2, i_D = 4,$$

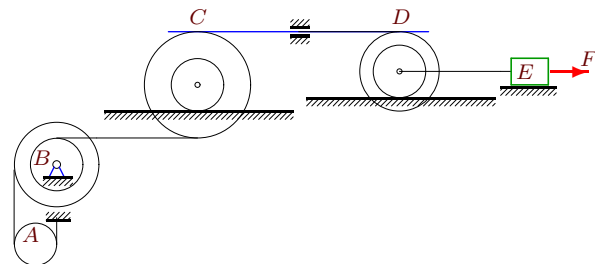
$$m_A = 20, m_B = 12,$$

$$m_C = 128, m_D = 28,$$

$$m_E = 192.$$

**Задача D33.31.**

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$$R_B = 4, r_B = 2, i_B = 2,$$

$$R_C = 4, r_C = 2, i_C = 3,$$

$$R_D = 3, r_D = 2, i_D = 2,$$

$$m_A = 4, m_B = 24,$$

$$m_C = 20, m_D = 100,$$

$$m_E = 75.$$

**D33 Ответы.****Кинетическая энергия системы. Приведенные массы** 17.09.2011

№	$\mu_A$	$\mu_B$	$\mu_C$	$\mu_D$	$\mu_E$	$\mu$
1	25	45	24	21	6	121
2	3	8	8	15	1	35
3	17	4	35	225	225	506
4	15	36	60	135	36	282
5	9	24	120	45	81	279
6	19	6	52	24	8	109
7	13	1	35	78	125	252
8	15	54	150	375	100	694
9	3	45	20	39	8	115
10	21	2	14	30	5	72
11	32	4	56	192	144	428
12	12	2	287	294	196	791
13	3	20	4	15	2	44
14	11	5	200	832	1024	2072
15	32	12	14	60	1	119
16	9	18	60	65	4	156
17	18	4	10	125	75	232
18	18	4	24	70	54	170
19	10	6	65	36	81	198
20	20	4	200	35	6	265
21	15	18	78	225	324	660
22	7	1	15	20	12	55
23	12	6	80	15	18	131
24	15	6	25	196	49	291
25	9	2	21	78	45	155
26	15	4	104	7	6	136
27	8	5	91	150	125	379
28	40	45	40	819	486	1430
29	20	12	35	125	625	817
30	25	12	104	35	54	230
31	6	24	65	288	108	491

D33 файл о33d5B