# 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 $\rho$ 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 $T = \mu v_1^2/2$, 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. <span style="color:red">(с.111)</span>
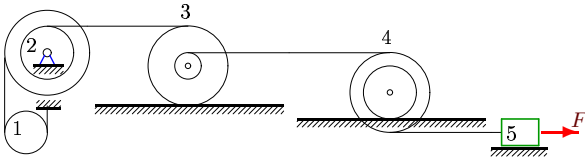
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**Задача D-33.1.** 22
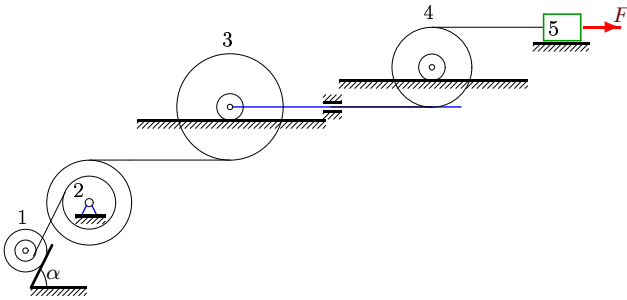


$R_1 = 2$, $r_1 = 1$, $\rho_1 = 1$,
$R_2 = 4$, $r_2 = 2$, $\rho_2 = 2$,
$R_3 = 4$, $r_3 = 1$, $\rho_3 = 3$,
$R_4 = 3$, $r_4 = 1$, $\rho_4 = 2$,
$m_1 = 20$, $m_2 = 80$,
$m_3 = 72$, $m_4 = 252$,
$m_5 = 54$.

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**Задача D-33.2.** 22



$R_2 = 4$, $r_2 = 2$, $\rho_2 = 2$,
$R_3 = 3$, $r_3 = 1$, $\rho_3 = 2$,
$R_4 = 3$, $r_4 = 2$, $\rho_4 = 2$,
$m_1 = 2$, $m_2 = 24$,
$m_3 = 144$, $m_4 = 225$,
$m_5 = 225$.

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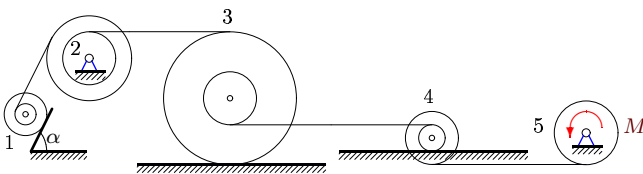
**Задача D-33.3.** 22



$R_1 = 2$, $r_1 = 1$, $\rho_1 = 1$,
$R_2 = 3$, $r_2 = 2$, $\rho_2 = 2$,
$R_3 = 5$, $r_3 = 2$, $\rho_3 = 4$,
$R_4 = 2$, $r_4 = 1$, $\rho_4 = 1$,
$m_1 = 8$, $m_2 = 24$,
$m_3 = 100$, $m_4 = 200$,
$m_5 = 800$.

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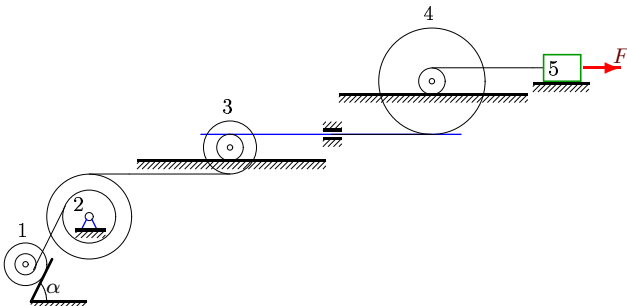
**Задача D-33.4.** 22



$R_1 = 2$, $r_1 = 1$, $\rho_1 = 2$,
$R_2 = 4$, $r_2 = 2$, $\rho_2 = 2$,
$R_3 = 2$, $r_3 = 1$, $\rho_3 = 1$,
$R_4 = 4$, $r_4 = 1$, $\rho_4 = 3$,
$m_1 = 12$, $m_2 = 64$,
$m_3 = 6$, $m_4 = 45$,
$m_5 = 36$.
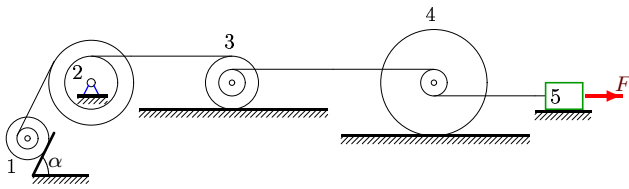
## Задача D-33.5.



$R_1 = 2$, $r_1 = 1$, $\rho_1 = 2$,
$R_2 = 3$, $r_2 = 2$, $\rho_2 = 3$,
$R_3 = 2$, $r_3 = 1$, $\rho_3 = 1$,
$R_4 = 4$, $r_4 = 1$, $\rho_4 = 3$,
$m_1 = 20$, $m_2 = 16$,
$m_3 = 128$, $m_4 = 112$,
$m_5 = 400$.
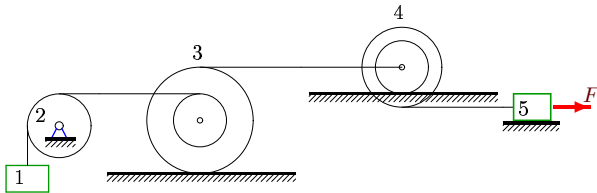
## Задача D-33.6.



$R_3 = 4$, $r_3 = 2$, $\rho_3 = 3$,
$R_4 = 3$, $r_4 = 2$, $\rho_4 = 2$,
$m_1 = 11$, $m_2 = 12$,
$m_3 = 144$, $m_4 = 27$,
$m_5 = 18$.
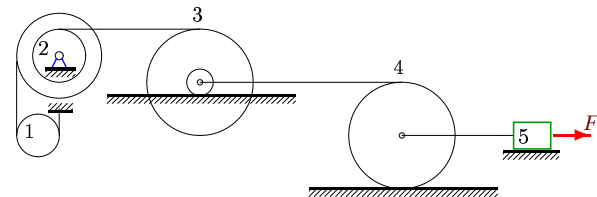
## Задача D-33.7.



$R_2 = 4$, $r_2 = 2$, $\rho_2 = 3$,
$R_3 = 4$, $r_3 = 1$, $\rho_3 = 3$,
$R_4 = 4$,
$m_1 = 6$, $m_2 = 12$,
$m_3 = 30$, $m_4 = 200$,
$m_5 = 100$.
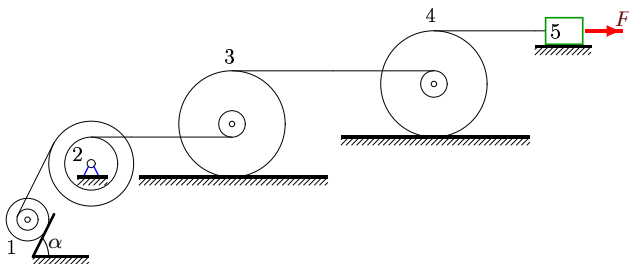
## Задача D-33.8.



$R_1 = 2$, $r_1 = 1$, $\rho_1 = 1$,
$R_2 = 3$, $r_2 = 2$, $\rho_2 = 3$,
$R_3 = 4$, $r_3 = 1$, $\rho_3 = 3$,
$R_4 = 4$, $r_4 = 1$, $\rho_4 = 3$,
$m_1 = 4$, $m_2 = 12$,
$m_3 = 36$, $m_4 = 27$,
$m_5 = 225$.
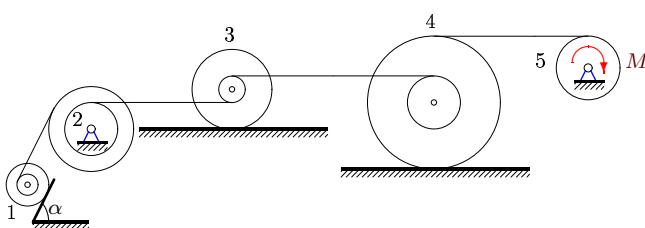
## Задача D-33.9.



$R_1 = 2$, $r_1 = 1$, $\rho_1 = 1$,
$R_2 = 3$, $r_2 = 2$, $\rho_2 = 3$,
$R_3 = 3$, $r_3 = 1$, $\rho_3 = 2$,
$R_4 = 5$, $r_4 = 2$, $\rho_4 = 4$,
$m_1 = 4$, $m_2 = 16$,
$m_3 = 16$, $m_4 = 49$,
$m_5 = 98$.
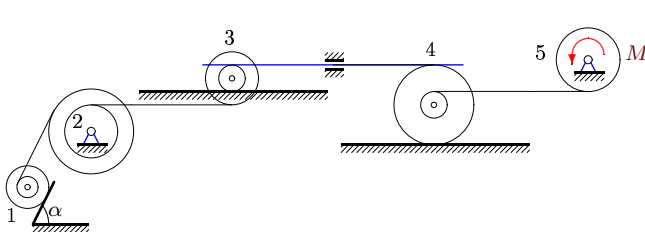
## Задача D-33.10.



$R_1 = 2$, $r_1 = 1$, $\rho_1 = 2$,
$R_2 = 3$, $r_2 = 2$, $\rho_2 = 3$,
$R_3 = 2$, $r_3 = 1$, $\rho_3 = 1$,
$R_4 = 3$, $r_4 = 1$, $\rho_4 = 2$,
$m_1 = 4$, $m_2 = 8$,
$m_3 = 4$, $m_4 = 27$,
$m_5 = 36$.
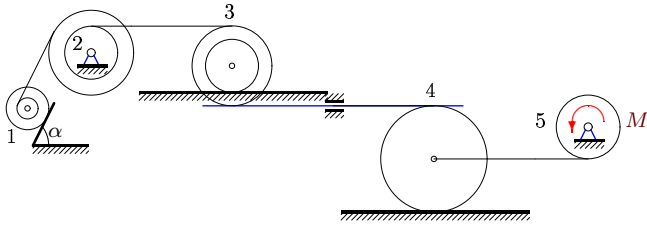
## Задача D-33.11.

$R_1 = 2$, $r_1 = 1$, $\rho_1 = 2$,
$R_2 = 3$, $r_2 = 2$, $\rho_2 = 3$,
$R_3 = 3$, $r_3 = 2$, $\rho_3 = 2$,
$R_4 = 4$,
$m_1 = 16$, $m_2 = 8$,
$m_3 = 175$, $m_4 = 200$,
$m_5 = 200$.
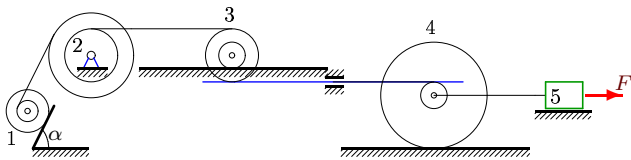
## Задача D-33.12.

$R_1 = 2$, $r_1 = 1$, $\rho_1 = 2$,
$R_2 = 3$, $r_2 = 2$, $\rho_2 = 3$,
$R_3 = 2$, $r_3 = 1$, $\rho_3 = 1$,
$R_4 = 4$, $r_4 = 1$, $\rho_4 = 3$,
$m_1 = 4$, $m_2 = 16$,
$m_3 = 36$, $m_4 = 27$,
$m_5 = 225$.
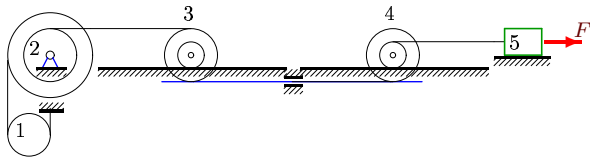
## Задача D-33.13.

$R_2 = 4$, $r_2 = 2$, $\rho_2 = 2$,
$R_3 = 2$, $r_3 = 1$, $\rho_3 = 1$,
$R_4 = 2$, $r_4 = 1$, $\rho_4 = 1$,
$m_1 = 2$, $m_2 = 24$,
$m_3 = 36$, $m_4 = 27$,
$m_5 = 18$.
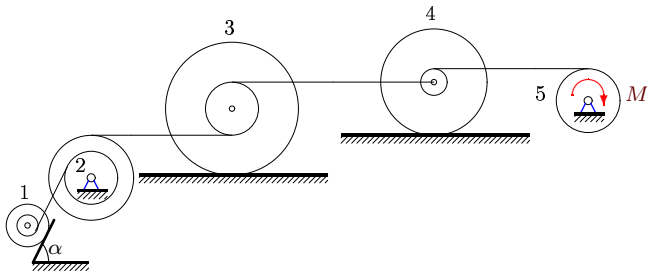
## Задача D-33.14.

$R_1 = 2$, $r_1 = 1$, $\rho_1 = 1$,
$R_2 = 4$, $r_2 = 2$, $\rho_2 = 3$,
$R_3 = 5$, $r_3 = 2$, $\rho_3 = 4$,
$R_4 = 4$, $r_4 = 1$, $\rho_4 = 3$,
$m_1 = 16$, $m_2 = 64$,
$m_3 = 63$, $m_4 = 144$,
$m_5 = 288$.
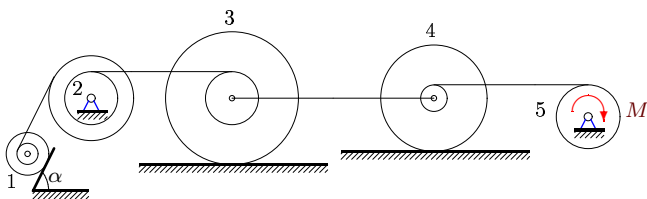
## Задача D-33.15.

$R_1 = 2$, $r_1 = 1$, $\rho_1 = 1$,
$R_2 = 3$, $r_2 = 2$, $\rho_2 = 3$,
$R_3 = 5$, $r_3 = 2$, $\rho_3 = 4$,
$R_4 = 4$, $r_4 = 1$, $\rho_4 = 3$,
$m_1 = 16$, $m_2 = 12$,
$m_3 = 343$, $m_4 = 784$,
$m_5 = 1568$.
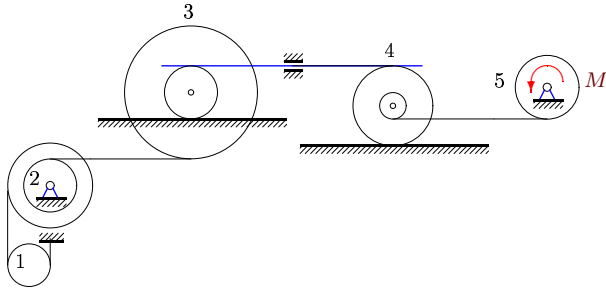
## Задача D-33.16.



$R_2 = 4$, $r_2 = 2$, $\rho_2 = 3$,
$R_3 = 5$, $r_3 = 2$, $\rho_3 = 4$,
$R_4 = 3$, $r_4 = 1$, $\rho_4 = 2$,
$m_1 = 8$, $m_2 = 20$,
$m_3 = 63$, $m_4 = 486$,
$m_5 = 162$.
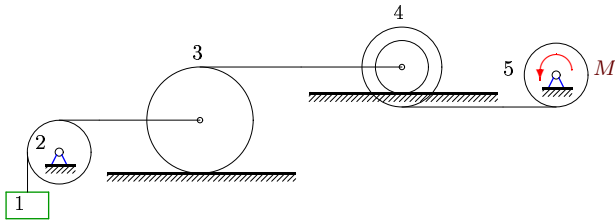
## Задача D-33.17.



$R_3 = 4$,
$R_4 = 3$, $r_4 = 2$, $\rho_4 = 2$,
$m_1 = 13$, $m_2 = 2$,
$m_3 = 8$, $m_4 = 3$,
$m_5 = 4$.
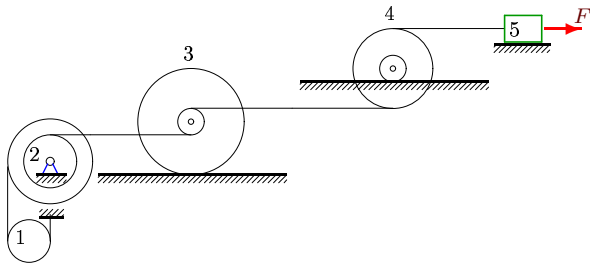
## Задача D-33.18.



$R_2 = 4$, $r_2 = 2$, $\rho_2 = 2$,
$R_3 = 4$, $r_3 = 1$, $\rho_3 = 3$,
$R_4 = 3$, $r_4 = 1$, $\rho_4 = 2$,
$m_1 = 10$, $m_2 = 20$,
$m_3 = 72$, $m_4 = 36$,
$m_5 = 54$.
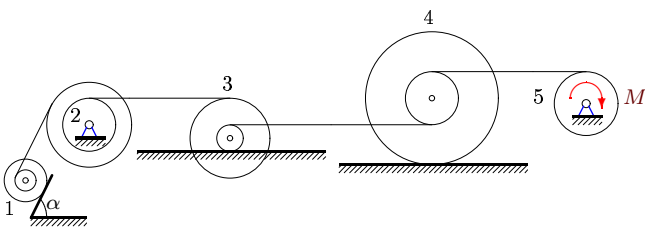
## Задача D-33.19.



$R_1 = 2$, $r_1 = 1$, $\rho_1 = 1$,
$R_2 = 3$, $r_2 = 2$, $\rho_2 = 3$,
$R_3 = 3$, $r_3 = 1$, $\rho_3 = 2$,
$R_4 = 5$, $r_4 = 2$, $\rho_4 = 4$,
$m_1 = 4$, $m_2 = 12$,
$m_3 = 64$, $m_4 = 108$,
$m_5 = 144$.
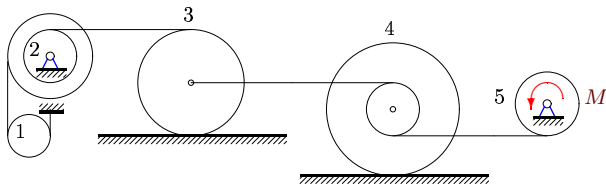
## Задача D-33.20.



$R_2 = 4$, $r_2 = 2$, $\rho_2 = 3$,
$R_3 = 4$,
$R_4 = 5$, $r_4 = 2$, $\rho_4 = 4$,
$m_1 = 2$, $m_2 = 12$,
$m_3 = 32$, $m_4 = 196$,
$m_5 = 392$.
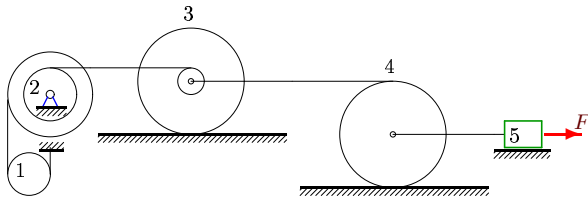
## Задача D-33.21.

$R_2 = 4$, $r_2 = 2$, $\rho_2 = 3$,
$R_3 = 4$, $r_3 = 1$, $\rho_3 = 3$,
$R_4 = 4$,
$m_1 = 10$, $m_2 = 8$,
$m_3 = 8$, $m_4 = 175$,
$m_5 = 150$.
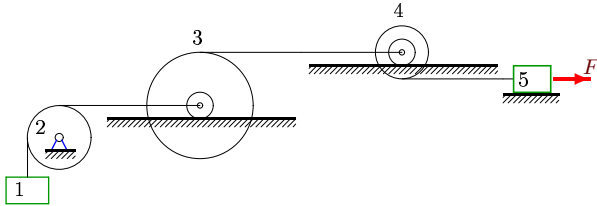
## Задача D-33.22.

$R_3 = 4$, $r_3 = 1$, $\rho_3 = 3$,
$R_4 = 2$, $r_4 = 1$, $\rho_4 = 1$,
$m_1 = 19$, $m_2 = 2$,
$m_3 = 6$, $m_4 = 5$,
$m_5 = 4$.
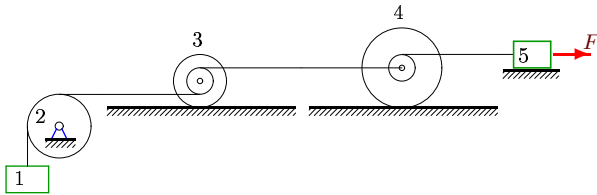
## Задача D-33.23.

$R_3 = 2$, $r_3 = 1$, $\rho_3 = 1$,
$R_4 = 3$, $r_4 = 1$, $\rho_4 = 2$,
$m_1 = 10$, $m_2 = 10$,
$m_3 = 4$, $m_4 = 3$,
$m_5 = 2$.
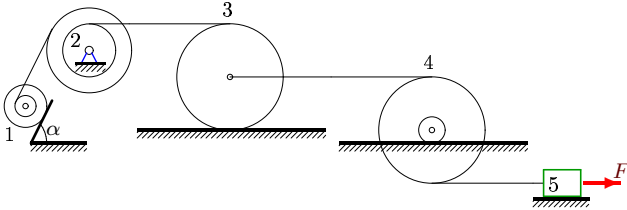
## Задача D-33.24.

$R_1 = 2$, $r_1 = 1$, $\rho_1 = 2$,
$R_2 = 3$, $r_2 = 2$, $\rho_2 = 2$,
$R_3 = 4$,
$R_4 = 4$, $r_4 = 1$, $\rho_4 = 3$,
$m_1 = 4$, $m_2 = 12$,
$m_3 = 32$, $m_4 = 30$,
$m_5 = 100$.
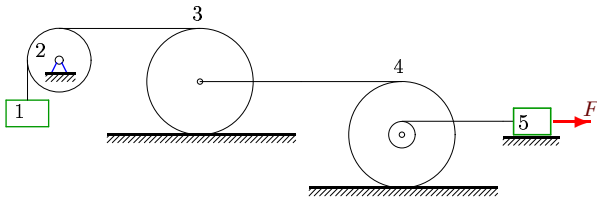
## Задача D-33.25.

$R_3 = 4$,
$R_4 = 4$, $r_4 = 1$, $\rho_4 = 3$,
$m_1 = 9$, $m_2 = 8$,
$m_3 = 64$, $m_4 = 256$,
$m_5 = 256$.
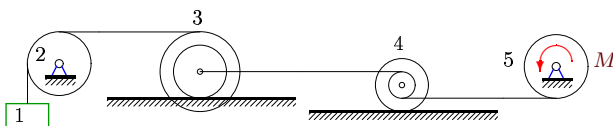
## Задача D-33.26.

$R_3 = 3$, $r_3 = 2$, $\rho_3 = 2$,
$R_4 = 2$, $r_4 = 1$, $\rho_4 = 1$,
$m_1 = 13$, $m_2 = 2$,
$m_3 = 100$, $m_4 = 135$,
$m_5 = 450$.

## Задача D-33.27.

22
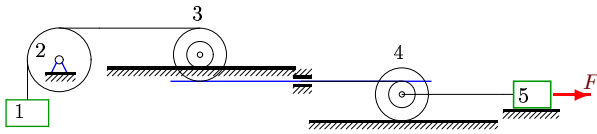


$R_3 = 2$, $r_3 = 1$, $\rho_3 = 1$,
$R_4 = 2$, $r_4 = 1$, $\rho_4 = 1$,
$m_1 = 13$, $m_2 = 12$,
$m_3 = 36$, $m_4 = 243$,
$m_5 = 162$.

## Задача D-33.28.

22
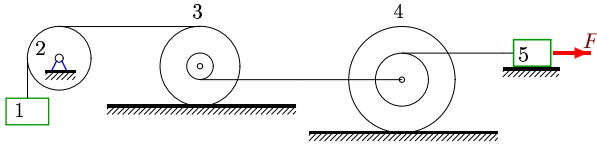


$R_3 = 3$, $r_3 = 1$, $\rho_3 = 2$,
$R_4 = 4$, $r_4 = 2$, $\rho_4 = 3$,
$m_1 = 7$, $m_2 = 10$,
$m_3 = 144$, $m_4 = 144$,
$m_5 = 8$.

## Задача D-33.29.

22
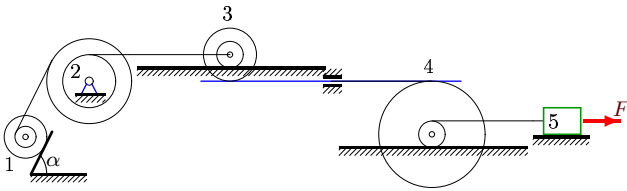


$R_1 = 2$, $r_1 = 1$, $\rho_1 = 2$,
$R_2 = 3$, $r_2 = 2$, $\rho_2 = 2$,
$R_3 = 2$, $r_3 = 1$, $\rho_3 = 1$,
$R_4 = 4$, $r_4 = 1$, $\rho_4 = 3$,
$m_1 = 20$, $m_2 = 12$,
$m_3 = 8$, $m_4 = 35$,
$m_5 = 150$.

## Задача D-33.30.

22
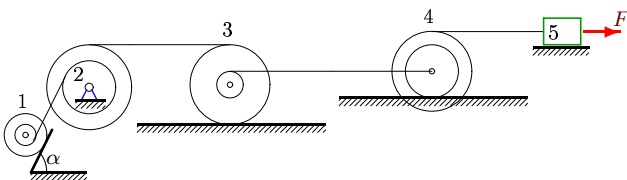


$R_1 = 2$, $r_1 = 1$, $\rho_1 = 1$,
$R_2 = 4$, $r_2 = 2$, $\rho_2 = 2$,
$R_3 = 3$, $r_3 = 1$, $\rho_3 = 2$,
$R_4 = 3$, $r_4 = 2$, $\rho_4 = 2$,
$m_1 = 20$, $m_2 = 96$,
$m_3 = 288$, $m_4 = 63$,
$m_5 = 54$.

D-33

<span style="color:red">**Ответы.**</span>

<span style="color:red">**Кинетическая энергия системы. Приведенные массы**</span>   03-Nov-16

| № | $\mu_1$ | $\mu_2$ | $\mu_3$ | $\mu_4$ | $\mu_5$ | $\sum \mu_k$ |
|---|---|---|---|---|---|---|
| 1 | 25 | 20 | 80 | 35 | 24 | 184 |
| 2 | 3 | 24 | 52 | 32 | 4 | 115 |
| 3 | 10 | 24 | 41 | 9 | 9 | 93 |
| 4 | 24 | 16 | 12 | 200 | 64 | 316 |
| 5 | 40 | 36 | 40 | 63 | 81 | 260 |
| 6 | 11 | 6 | 100 | 96 | 8 | 221 |
| 7 | 9 | 27 | 12 | 3 | 1 | 52 |
| 8 | 5 | 27 | 100 | 192 | 4096 | 4420 |
| 9 | 5 | 36 | 52 | 164 | 400 | 657 |
| 10 | 8 | 18 | 8 | 39 | 32 | 105 |
| 11 | 32 | 18 | 56 | 3 | 1 | 110 |
| 12 | 8 | 36 | 8 | 3 | 16 | 71 |
| 13 | 3 | 24 | 8 | 6 | 8 | 49 |
| 14 | 20 | 36 | 287 | 1225 | 1225 | 2793 |
| 15 | 20 | 27 | 287 | 625 | 625 | 1584 |
| 16 | 12 | 45 | 140 | 312 | 16 | 525 |
| 17 | 13 | 1 | 12 | 24 | 2 | 52 |
| 18 | 15 | 20 | 200 | 125 | 600 | 960 |
| 19 | 5 | 27 | 20 | 123 | 98 | 273 |
| 20 | 3 | 27 | 12 | 41 | 9 | 92 |
| 21 | 15 | 18 | 8 | 42 | 24 | 107 |
| 22 | 19 | 1 | 60 | 250 | 100 | 430 |
| 23 | 10 | 5 | 20 | 39 | 32 | 106 |
| 24 | 8 | 12 | 12 | 3 | 9 | 44 |
| 25 | 9 | 4 | 24 | 25 | 25 | 87 |
| 26 | 13 | 1 | 32 | 12 | 4 | 62 |
| 27 | 13 | 6 | 8 | 15 | 8 | 50 |
| 28 | 7 | 5 | 52 | 25 | 2 | 91 |
| 29 | 40 | 12 | 16 | 14 | 24 | 106 |
| 30 | 25 | 24 | 104 | 56 | 150 | 359 |

*D-33* файл    33d22-AnsE