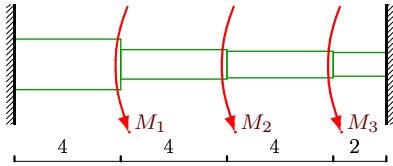


Кручение

К стержню кусочно-постоянного круглого сечения приложены моменты M_1 , M_2 , M_3 . Дан ряд $p = [0.2, 0.3, 0.4, 0.1]$ распределения дискретной случайной величины диаметра одного из участков стержня. Найти математическое ожидание момента левой заделки. Модуль сдвига материала $G = 80 \text{ ГПа}$. Длины участков даны в метрах.

Задача L-23.1.

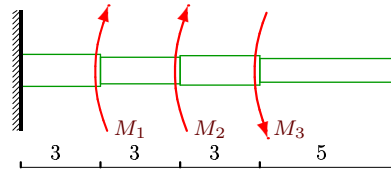
2



$M_1 = 52 \text{ кНм}$, $M_2 = 42 \text{ кНм}$,
 $M_3 = 32 \text{ кНм}$, $d_2 = 11 \text{ см}$, $d_3 = 10 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_1 = [19, 20.5, 21, 22] \text{ см}$.

Задача L-23.2.

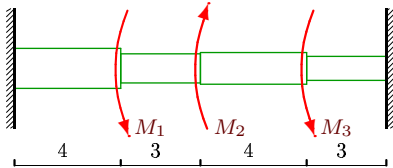
2



$M_1 = 14 \text{ кНм}$, $M_2 = 30 \text{ кНм}$,
 $M_3 = 7 \text{ кНм}$, $d_1 = 12 \text{ см}$, $d_3 = 11 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_2 = [10.5, 11, 12, 13] \text{ см}$.

Задача L-23.3.

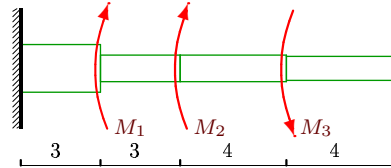
2



$M_1 = 8 \text{ кНм}$, $M_2 = 30 \text{ кНм}$,
 $M_3 = 45 \text{ кНм}$, $d_1 = 15 \text{ см}$, $d_2 = 11 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_3 = [12, 13.5, 14, 15] \text{ см}$.

Задача L-23.4.

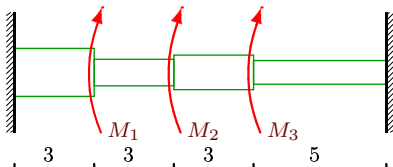
2



$M_1 = 6 \text{ кНм}$, $M_2 = 52 \text{ кНм}$,
 $M_3 = 36 \text{ кНм}$, $d_2 = 10 \text{ см}$, $d_3 = 10 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_1 = [18.5, 19, 20, 21] \text{ см}$.

Задача L-23.5.

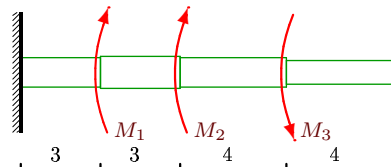
2



$M_1 = 21 \text{ кНм}$, $M_2 = 27 \text{ кНм}$,
 $M_3 = 14 \text{ кНм}$, $d_1 = 18 \text{ см}$, $d_2 = 10 \text{ см}$,
 $d_3 = 13 \text{ см}$,
 $d_4 = [9.5, 10, 11, 12] \text{ см}$.

Задача L-23.6.

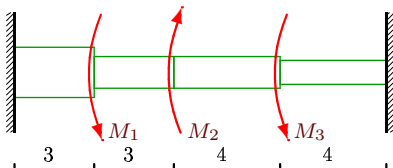
2



$M_1 = 7 \text{ кНм}$, $M_2 = 39 \text{ кНм}$,
 $M_3 = 24 \text{ кНм}$, $d_1 = 11 \text{ см}$, $d_3 = 11 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_2 = [12, 13, 14.5, 15] \text{ см}$.

Задача L-23.7.

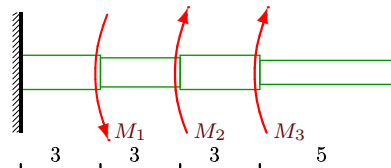
2



$M_1 = 7 \text{ кНм}$, $M_2 = 24 \text{ кНм}$,
 $M_3 = 16 \text{ кНм}$, $d_1 = 19 \text{ см}$, $d_2 = 12 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_3 = [12, 13, 14.5, 15] \text{ см}$.

Задача L-23.8.

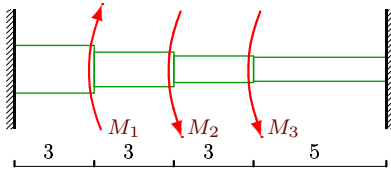
2



$M_1 = 7 \text{ кНм}$, $M_2 = 7 \text{ кНм}$,
 $M_3 = 24 \text{ кНм}$, $d_1 = 13 \text{ см}$, $d_2 = 11 \text{ см}$,
 $d_3 = 13 \text{ см}$,
 $d_4 = [9, 10.5, 11, 12] \text{ см}$.

Задача L-23.9.

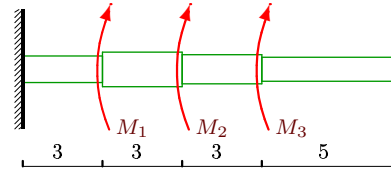
2



$M_1 = 40$ кНм, $M_2 = 7$ кНм,
 $M_3 = 7$ кНм, $d_2 = 13$ см, $d_3 = 10$ см,
 $d_4 = 9$ см.
 $d_1 = [18, 19, 20, 21.5]$ см.

Задача L-23.10.

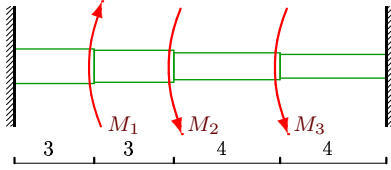
2



$M_1 = 16$ кНм, $M_2 = 18$ кНм,
 $M_3 = 10$ кНм, $d_1 = 10$ см, $d_3 = 11$ см,
 $d_4 = 9$ см.
 $d_2 = [13, 14, 15, 16.5]$ см.

Задача L-23.11.

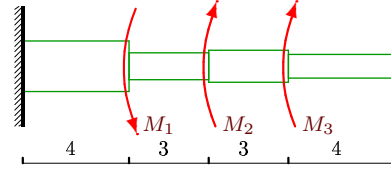
2



$M_1 = 30$ кНм, $M_2 = 7$ кНм,
 $M_3 = 60$ кНм, $d_2 = 12$ см, $d_3 = 10$ см,
 $d_4 = 9$ см.
 $d_1 = [13, 14, 15.5, 16]$ см.

Задача L-23.12.

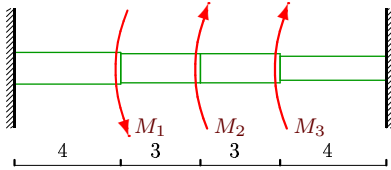
2



$M_1 = 27$ кНм, $M_2 = 7$ кНм,
 $M_3 = 42$ кНм, $d_1 = 19$ см, $d_2 = 10$ см,
 $d_4 = 9$ см.
 $d_3 = [12.5, 13, 14, 15]$ см.

Задача L-23.13.

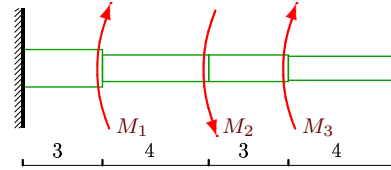
2



$M_1 = 9$ кНм, $M_2 = 6$ кНм,
 $M_3 = 24$ кНм, $d_1 = 12$ см, $d_3 = 11$ см,
 $d_4 = 9$ см.
 $d_2 = [11, 12.5, 13, 14]$ см.

Задача L-23.14.

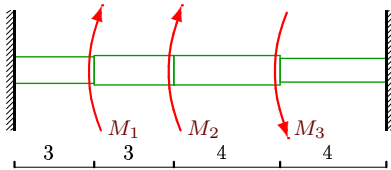
2



$M_1 = 13$ кНм, $M_2 = 24$ кНм,
 $M_3 = 26$ кНм, $d_2 = 10$ см, $d_3 = 10$ см,
 $d_4 = 9$ см.
 $d_1 = [14.5, 15, 16, 17]$ см.

Задача L-23.15.

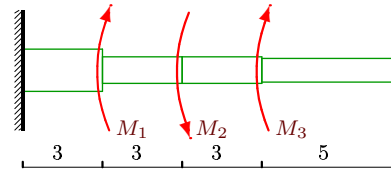
2



$M_1 = 27$ кНм, $M_2 = 11$ кНм,
 $M_3 = 9$ кНм, $d_1 = 10$ см, $d_3 = 11$ см,
 $d_4 = 9$ см.
 $d_2 = [11, 12.5, 13, 14]$ см.

Задача L-23.16.

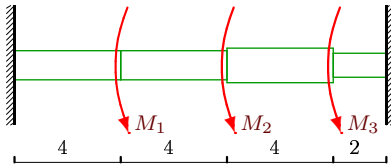
2



$M_1 = 40$ кНм, $M_2 = 7$ кНм,
 $M_3 = 44$ кНм, $d_2 = 10$ см, $d_3 = 10$ см,
 $d_4 = 9$ см.
 $d_1 = [16.5, 17, 18, 19]$ см.

Задача L-23.17.

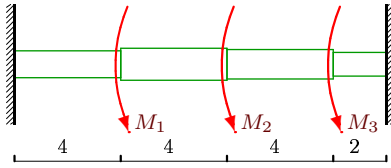
2



$M_1 = 48 \text{ кНм}$, $M_2 = 22 \text{ кНм}$,
 $M_3 = 9 \text{ кНм}$, $d_1 = 11 \text{ см}$, $d_2 = 11 \text{ см}$,
 $d_3 = 13 \text{ см}$,
 $d_4 = [9, 10.5, 11, 12] \text{ см}$.

Задача L-23.19.

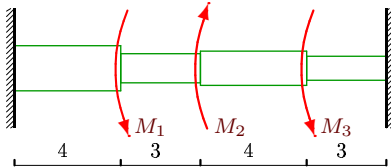
2



$M_1 = 13 \text{ кНм}$, $M_2 = 36 \text{ кНм}$,
 $M_3 = 14 \text{ кНм}$, $d_1 = 10 \text{ см}$, $d_3 = 11 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_2 = [12, 13, 14.5, 15] \text{ см}$.

Задача L-23.21.

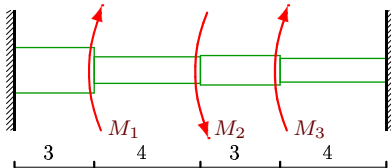
2



$M_1 = 18 \text{ кНм}$, $M_2 = 44 \text{ кНм}$,
 $M_3 = 7 \text{ кНм}$, $d_1 = 17 \text{ см}$, $d_2 = 11 \text{ см}$,
 $d_3 = 13 \text{ см}$,
 $d_4 = [9, 10.5, 11, 12] \text{ см}$.

Задача L-23.23.

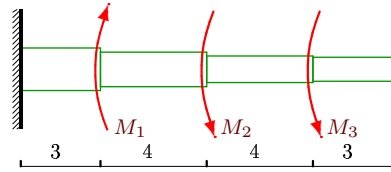
2



$M_1 = 44 \text{ кНм}$, $M_2 = 9 \text{ кНм}$,
 $M_3 = 11 \text{ кНм}$, $d_1 = 17 \text{ см}$, $d_3 = 11 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_2 = [10.5, 11, 12, 13] \text{ см}$.

Задача L-23.18.

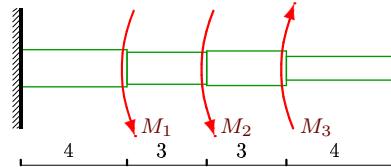
2



$M_1 = 15 \text{ кНм}$, $M_2 = 75 \text{ кНм}$,
 $M_3 = 45 \text{ кНм}$, $d_2 = 13 \text{ см}$, $d_3 = 10 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_1 = [16, 17, 18, 19.5] \text{ см}$.

Задача L-23.20.

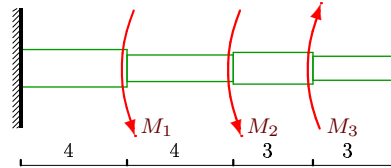
2



$M_1 = 10 \text{ кНм}$, $M_2 = 7 \text{ кНм}$,
 $M_3 = 28 \text{ кНм}$, $d_1 = 14 \text{ см}$, $d_2 = 12 \text{ см}$,
 $d_3 = 13 \text{ см}$,
 $d_4 = [9, 10, 11.5, 12] \text{ см}$.

Задача L-23.22.

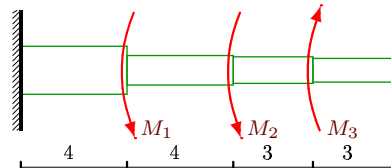
2



$M_1 = 24 \text{ кНм}$, $M_2 = 14 \text{ кНм}$,
 $M_3 = 45 \text{ кНм}$, $d_1 = 14 \text{ см}$, $d_2 = 10 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_3 = [12.5, 13, 14, 15] \text{ см}$.

Задача L-23.24.

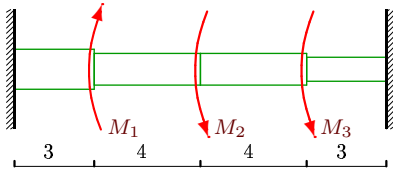
2



$M_1 = 55 \text{ кНм}$, $M_2 = 7 \text{ кНм}$,
 $M_3 = 24 \text{ кНм}$, $d_2 = 11 \text{ см}$, $d_3 = 10 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_1 = [18, 19.5, 20, 21] \text{ см}$.

Задача L-23.25.

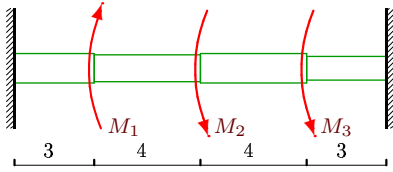
2



$M_1 = 42 \text{ кНм}$, $M_2 = 44 \text{ кНм}$,
 $M_3 = 7 \text{ кНм}$, $d_1 = 15 \text{ см}$, $d_2 = 12 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_3 = [12, 13, 14.5, 15] \text{ см}$.

Задача L-23.27.

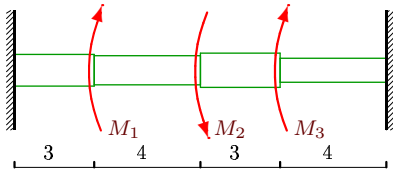
2



$M_1 = 22 \text{ кНм}$, $M_2 = 11 \text{ кНм}$,
 $M_3 = 10 \text{ кНм}$, $d_1 = 11 \text{ см}$, $d_3 = 11 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_2 = [10.5, 11, 12, 13] \text{ см}$.

Задача L-23.29.

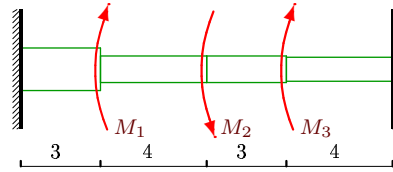
2



$M_1 = 15 \text{ кНм}$, $M_2 = 40 \text{ кНм}$,
 $M_3 = 18 \text{ кНм}$, $d_1 = 12 \text{ см}$, $d_2 = 11 \text{ см}$,
 $d_3 = 13 \text{ см}$,
 $d_4 = [9, 10.5, 11, 12] \text{ см}$.

Задача L-23.26.

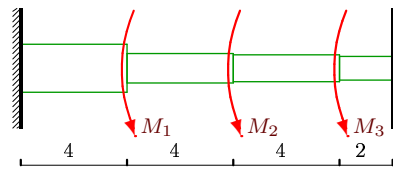
2



$M_1 = 24 \text{ кНм}$, $M_2 = 18 \text{ кНм}$,
 $M_3 = 12 \text{ кНм}$, $d_2 = 10 \text{ см}$, $d_3 = 10 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_1 = [16.5, 17, 18, 19] \text{ см}$.

Задача L-23.28.

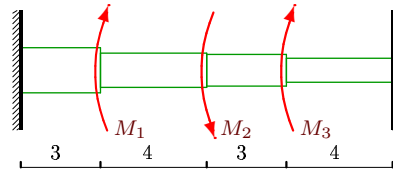
2



$M_1 = 28 \text{ кНм}$, $M_2 = 52 \text{ кНм}$,
 $M_3 = 36 \text{ кНм}$, $d_2 = 11 \text{ см}$, $d_3 = 10 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_1 = [18, 19.5, 20, 21] \text{ см}$.

Задача L-23.30.

2



$M_1 = 33 \text{ кНм}$, $M_2 = 6 \text{ кНм}$,
 $M_3 = 56 \text{ кНм}$, $d_1 = 17 \text{ см}$, $d_2 = 13 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_3 = [12, 13, 14, 15.5] \text{ см}$.

Отвeты.
Кручение

22-Jan-16

№	M_A
	кНм
1	90.135
2	-30.793
3	10.943
4	-28.866
5	-43.714
6	-22.557
7	-1.873
8	-10.166
9	-28.533
10	-31.107
11	7.368
12	-3.345
13	-9.748
14	-8.104
15	-24.040
16	-57.778
17	42.426
18	67.829
19	31.050
20	-0.491
21	-7.287
22	9.417
23	-41.969
24	48.187
25	-4.496
26	-16.669
27	-7.385
28	74.564
29	0.991
30	-65.580

L-23 файл о23L2A