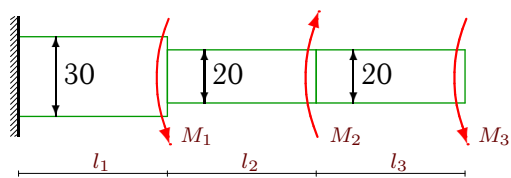


Кручение стержней кругового сечения

К стальному стержню кусочно-постоянного круглого сечения приложены моменты M_1 , M_2 , M_3 . Построить эпюры углов закручивания и касательных напряжений на поверхности вала. Модуль сдвига материала $G = 80 \text{ ГПа}$. Диаметры даны в сантиметрах.

Задача M28.1.

2

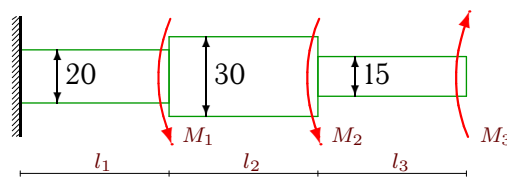


$$M_1 = 7 \text{ кНм}, M_2 = 42 \text{ кНм}, M_3 = 44 \text{ кНм},$$

$$l_1 = 3 \text{ м}, l_2 = 2.4 \text{ м}, l_3 = 3.8 \text{ м}.$$

Задача M28.2.

2

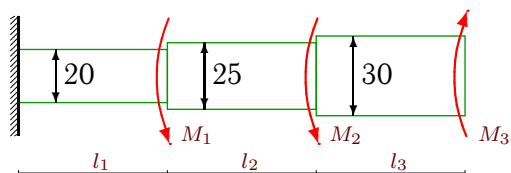


$$M_1 = 60 \text{ кНм}, M_2 = 16 \text{ кНм}, M_3 = 12 \text{ кНм},$$

$$l_1 = 4 \text{ м}, l_2 = 3.4 \text{ м}, l_3 = 2.6 \text{ м}.$$

Задача M28.3.

2

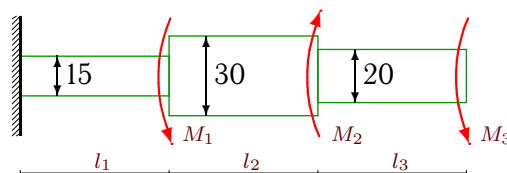


$$M_1 = 13 \text{ кНм}, M_2 = 18 \text{ кНм}, M_3 = 40 \text{ кНм},$$

$$l_1 = 3.2 \text{ м}, l_2 = 3.6 \text{ м}, l_3 = 2.2 \text{ м}.$$

Задача M28.4.

2

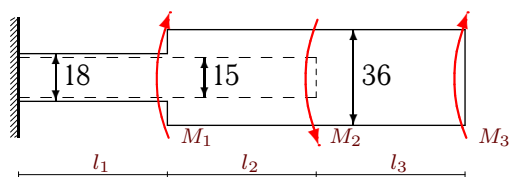


$$M_1 = 18 \text{ кНм}, M_2 = 60 \text{ кНм}, M_3 = 35 \text{ кНм},$$

$$l_1 = 3.6 \text{ м}, l_2 = 2.2 \text{ м}, l_3 = 4 \text{ м}.$$

Задача M28.5.

2

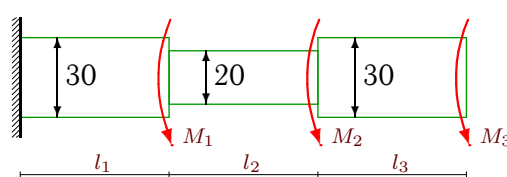


$$M_1 = 45 \text{ кНм}, M_2 = 30 \text{ кНм}, M_3 = 28 \text{ кНм},$$

$$l_1 = 2.4 \text{ м}, l_2 = 4 \text{ м}, l_3 = 2.2 \text{ м}.$$

Задача M28.6.

2

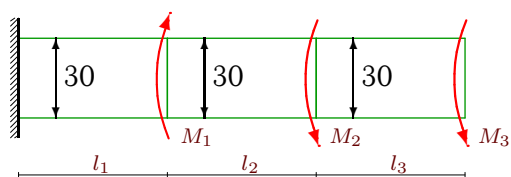


$$M_1 = 7 \text{ кНм}, M_2 = 7 \text{ кНм}, M_3 = 30 \text{ кНм},$$

$$l_1 = 3 \text{ м}, l_2 = 3 \text{ м}, l_3 = 4 \text{ м}.$$

Задача M28.7.

2

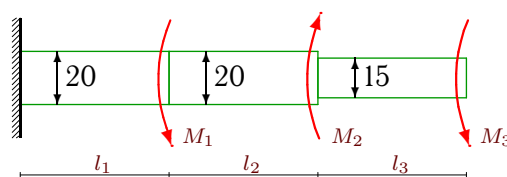


$$M_1 = 10 \text{ кНм}, M_2 = 7 \text{ кНм}, M_3 = 7 \text{ кНм},$$

$$l_1 = 2.8 \text{ м}, l_2 = 3 \text{ м}, l_3 = 3 \text{ м}.$$

Задача M28.8.

2

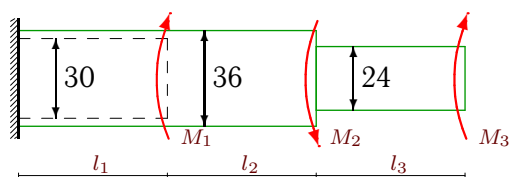


$$M_1 = 16 \text{ кНм}, M_2 = 20 \text{ кНм}, M_3 = 7 \text{ кНм},$$

$$l_1 = 3.4 \text{ м}, l_2 = 2.6 \text{ м}, l_3 = 3 \text{ м}.$$

Задача M28.9.

2

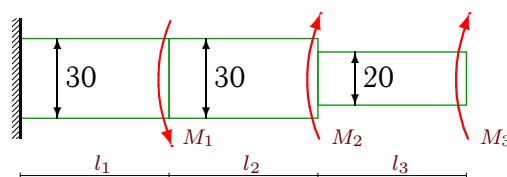


$$M_1 = 60 \text{ кНм}, M_2 = 45 \text{ кНм}, M_3 = 8 \text{ кНм},$$

$$l_1 = 2.2 \text{ м}, l_2 = 4 \text{ м}, l_3 = 2.8 \text{ м}.$$

Задача M28.10.

2

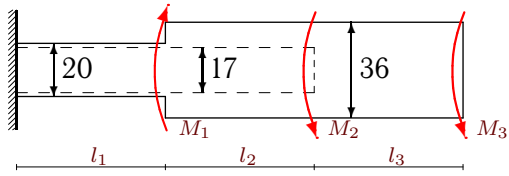


$$M_1 = 7 \text{ кНм}, M_2 = 36 \text{ кНм}, M_3 = 14 \text{ кНм},$$

$$l_1 = 3 \text{ м}, l_2 = 2.2 \text{ м}, l_3 = 2.8 \text{ м}.$$

Задача M28.11.

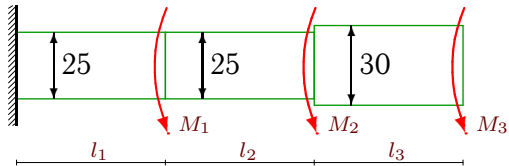
2



$M_1=36\text{кНм}$, $M_2=22\text{кНм}$, $M_3=11\text{кНм}$,
 $l_1=2.4\text{м}$, $l_2=3.4\text{м}$, $l_3=3.2\text{м}$.

Задача M28.13.

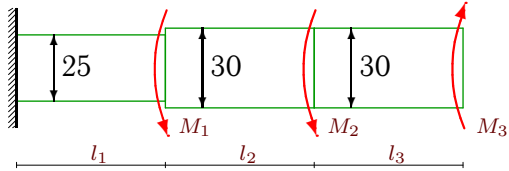
2



$M_1=75\text{кНм}$, $M_2=60\text{кНм}$, $M_3=30\text{кНм}$,
 $l_1=4\text{м}$, $l_2=4\text{м}$, $l_3=3.4\text{м}$.

Задача M28.15.

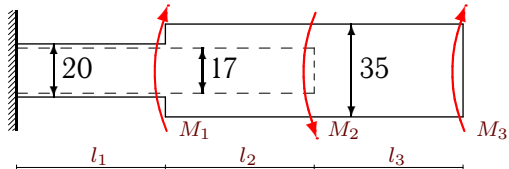
2



$M_1=60\text{кНм}$, $M_2=16\text{кНм}$, $M_3=24\text{кНм}$,
 $l_1=4\text{м}$, $l_2=3.4\text{м}$, $l_3=2.6\text{м}$.

Задача M28.17.

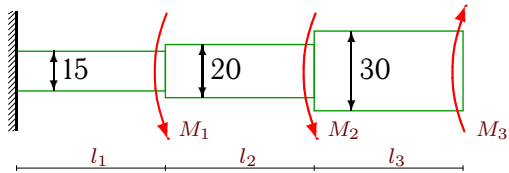
2



$M_1=42\text{кНм}$, $M_2=24\text{кНм}$, $M_3=32\text{кНм}$,
 $l_1=2.4\text{м}$, $l_2=3.8\text{м}$, $l_3=2.2\text{м}$.

Задача M28.19.

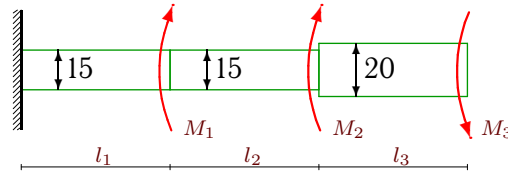
2



$M_1=24\text{кНм}$, $M_2=12\text{кНм}$, $M_3=24\text{кНм}$,
 $l_1=3.4\text{м}$, $l_2=3.4\text{м}$, $l_3=2.2\text{м}$.

Задача M28.12.

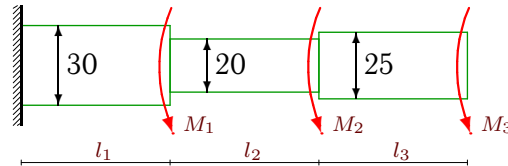
2



$M_1=8\text{кНм}$, $M_2=30\text{кНм}$, $M_3=50\text{кНм}$,
 $l_1=2.8\text{м}$, $l_2=2.6\text{м}$, $l_3=4\text{м}$.

Задача M28.14.

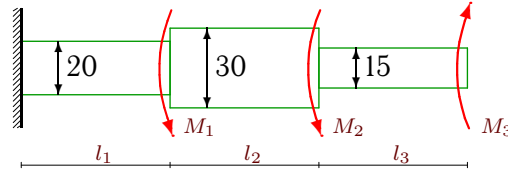
2



$M_1=33\text{кНм}$, $M_2=12\text{кНм}$, $M_3=20\text{кНм}$,
 $l_1=3.6\text{м}$, $l_2=3.2\text{м}$, $l_3=3.4\text{м}$.

Задача M28.16.

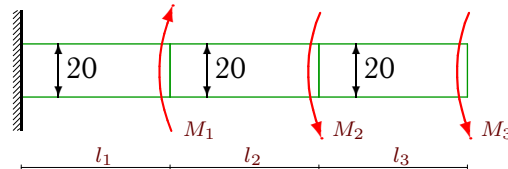
2



$M_1=50\text{кНм}$, $M_2=7\text{кНм}$, $M_3=16\text{кНм}$,
 $l_1=4\text{м}$, $l_2=3\text{м}$, $l_3=2.6\text{м}$.

Задача M28.18.

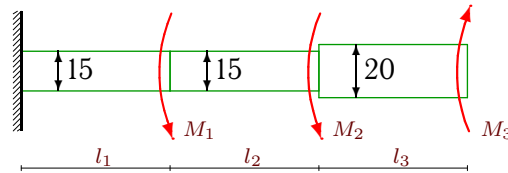
2



$M_1=14\text{кНм}$, $M_2=60\text{кНм}$, $M_3=75\text{кНм}$,
 $l_1=2.8\text{м}$, $l_2=3.8\text{м}$, $l_3=4\text{м}$.

Задача M28.20.

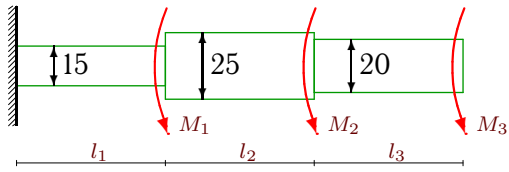
2



$M_1=11\text{кНм}$, $M_2=7\text{кНм}$, $M_3=39\text{кНм}$,
 $l_1=3.2\text{м}$, $l_2=3.2\text{м}$, $l_3=2.4\text{м}$.

Задача M28.21.

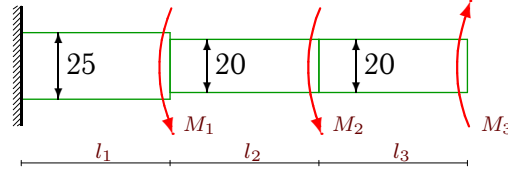
2



$M_1=55\text{кНм}$, $M_2=13\text{кНм}$, $M_3=42\text{кНм}$,
 $l_1=4\text{м}$, $l_2=3.2\text{м}$, $l_3=3.6\text{м}$.

Задача M28.22.

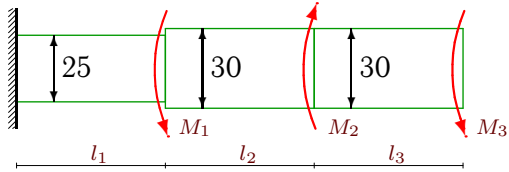
2



$M_1=30\text{кНм}$, $M_2=35\text{кНм}$, $M_3=27\text{кНм}$,
 $l_1=3.4\text{м}$, $l_2=4\text{м}$, $l_3=2.4\text{м}$.

Задача M28.23.

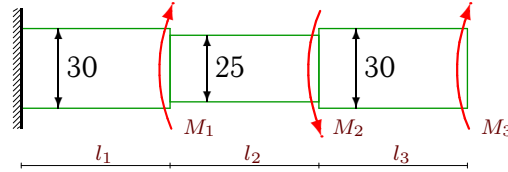
2



$M_1=7\text{кНм}$, $M_2=52\text{кНм}$, $M_3=21\text{кНм}$,
 $l_1=3\text{м}$, $l_2=2.2\text{м}$, $l_3=3.6\text{м}$.

Задача M28.24.

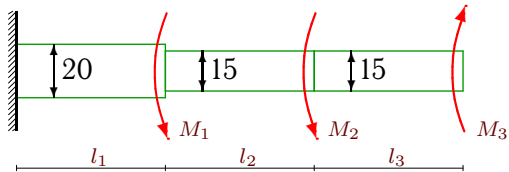
2



$M_1=28\text{кНм}$, $M_2=36\text{кНм}$, $M_3=11\text{кНм}$,
 $l_1=2.6\text{м}$, $l_2=3.8\text{м}$, $l_3=2.8\text{м}$.

Задача M28.25.

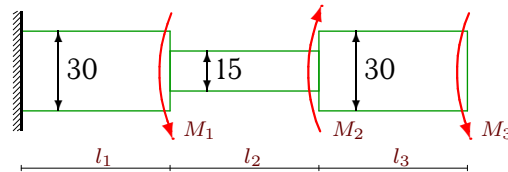
2



$M_1=20\text{кНм}$, $M_2=7\text{кНм}$, $M_3=6\text{кНм}$,
 $l_1=3.4\text{м}$, $l_2=3\text{м}$, $l_3=2.8\text{м}$.

Задача M28.26.

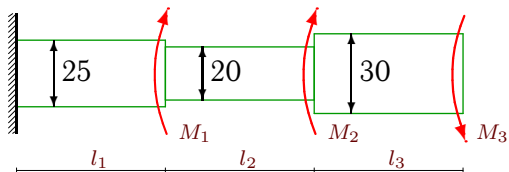
2



$M_1=27\text{кНм}$, $M_2=13\text{кНм}$, $M_3=33\text{кНм}$,
 $l_1=3.6\text{м}$, $l_2=2.8\text{м}$, $l_3=3.6\text{м}$.

Задача M28.27.

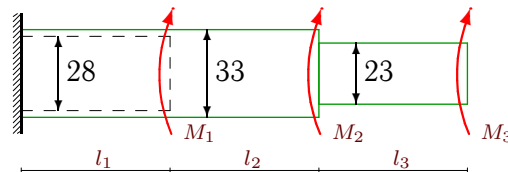
2



$M_1=9\text{кНм}$, $M_2=11\text{кНм}$, $M_3=8\text{кНм}$,
 $l_1=2.8\text{м}$, $l_2=2.8\text{м}$, $l_3=3.2\text{м}$.

Задача M28.28.

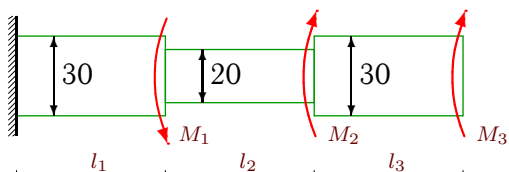
2



$M_1=36\text{кНм}$, $M_2=9\text{кНм}$, $M_3=9\text{кНм}$,
 $l_1=2.2\text{м}$, $l_2=2.8\text{м}$, $l_3=2.8\text{м}$.

Задача M28.29.

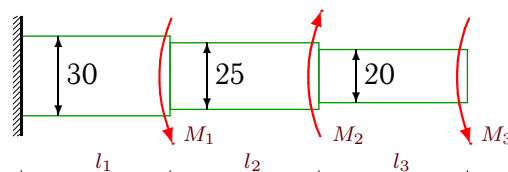
2



$M_1=40\text{кНм}$, $M_2=14\text{кНм}$, $M_3=33\text{кНм}$,
 $l_1=4\text{м}$, $l_2=2.6\text{м}$, $l_3=2.4\text{м}$.

Задача M28.30.

2



$M_1=32\text{кНм}$, $M_2=24\text{кНм}$, $M_3=18\text{кНм}$,
 $l_1=3.8\text{м}$, $l_2=2.6\text{м}$, $l_3=3.4\text{м}$.

М28 Ответы.**Кручение стержней кругового сечения**

17.02.2012

№	φ_1	φ_2	φ_3	τ_1	τ_2	τ_3
	рад·100			МПа		
1	0.042	0.081	1.411	1.698	1.273	28.011
2	2.037	2.059	1.274	40.744	0.755	-18.108
3	-0.229	-0.487	-0.626	-5.730	-7.171	-7.545
4	-0.634	-0.720	0.394	-10.563	-4.716	22.282
5	-2.418	-2.411	-2.458	-72.528	0.094	-3.056
6	0.207	1.091	1.279	8.300	23.555	5.659
7	0.018	0.084	0.117	0.755	2.641	1.320
8	0.081	-0.188	0.340	1.910	-8.276	10.563
9	-0.074	0.038	-0.048	-4.849	3.366	-2.947
10	-0.203	-0.376	-0.688	-8.111	-9.431	-8.913
11	-0.120	-0.030	-0.004	-3.996	1.790	1.201
12	0.845	2.153	3.744	18.108	30.180	31.831
13	2.151	3.325	3.485	53.782	29.335	5.659
14	0.368	1.183	1.404	12.261	20.372	6.519
15	0.678	0.635	0.537	16.949	-1.509	-4.527
16	1.305	1.263	0.216	26.101	-1.698	-24.144
17	-1.998	-2.025	-2.085	-66.593	-0.489	-3.801
18	2.696	6.778	9.166	77.031	85.944	47.746
19	1.026	0.701	0.618	18.108	-7.639	-4.527
20	-1.690	-4.266	-5.010	-31.690	-48.289	-24.828
21	11.066	11.640	12.843	165.993	17.927	26.738
22	0.421	0.676	0.160	12.386	5.093	-17.189
23	-0.235	-0.342	-0.223	-7.823	-5.847	3.961
24	-0.012	0.297	0.249	-0.566	8.149	-2.075
25	0.568	0.644	0.221	13.369	1.509	-9.054
26	0.266	1.674	1.861	8.866	30.180	6.225
27	-0.110	-0.176	-0.136	-3.911	-1.910	1.509
28	-0.265	-0.319	-0.434	-15.887	-2.164	-3.767
29	-0.044	-1.016	-1.141	-1.320	-29.921	-6.225
30	0.155	0.104	0.591	4.904	-1.956	11.459

М28 файл о28m2A