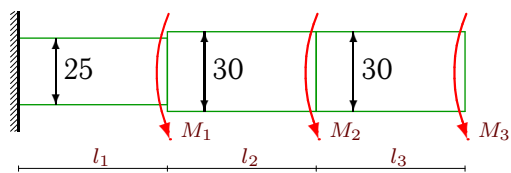


Кручение стержней кругового сечения

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.

3

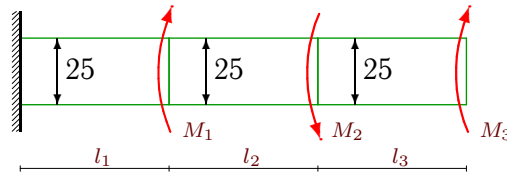


$$M_1 = 7 \text{ кНм}, M_2 = 26 \text{ кНм}, M_3 = 36 \text{ кНм},$$

$$l_1 = 3 \text{ м}, l_2 = 3.4 \text{ м}, l_3 = 3.6 \text{ м}.$$

Задача M28.2.

3

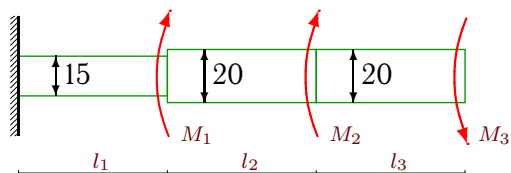


$$M_1 = 12 \text{ кНм}, M_2 = 12 \text{ кНм}, M_3 = 36 \text{ кНм},$$

$$l_1 = 2.8 \text{ м}, l_2 = 3.4 \text{ м}, l_3 = 2.2 \text{ м}.$$

Задача M28.3.

3

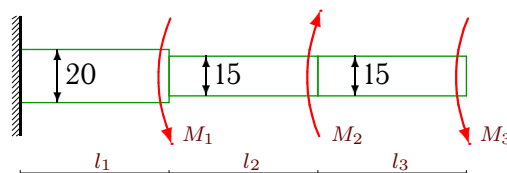


$$M_1 = 14 \text{ кНм}, M_2 = 42 \text{ кНм}, M_3 = 40 \text{ кНм},$$

$$l_1 = 2.6 \text{ м}, l_2 = 2.4 \text{ м}, l_3 = 3.8 \text{ м}.$$

Задача M28.4.

3

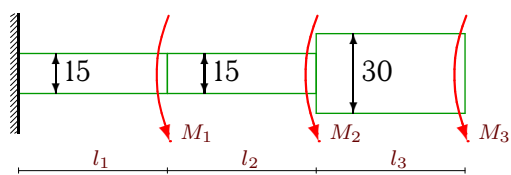


$$M_1 = 45 \text{ кНм}, M_2 = 14 \text{ кНм}, M_3 = 40 \text{ кНм},$$

$$l_1 = 4 \text{ м}, l_2 = 2.8 \text{ м}, l_3 = 3.8 \text{ м}.$$

Задача M28.5.

3

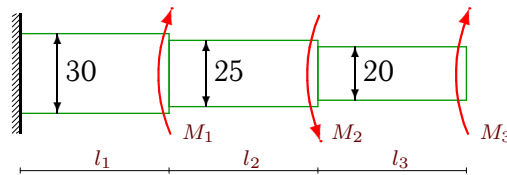


$$M_1 = 30 \text{ кНм}, M_2 = 55 \text{ кНм}, M_3 = 14 \text{ кНм},$$

$$l_1 = 3.4 \text{ м}, l_2 = 4 \text{ м}, l_3 = 3.2 \text{ м}.$$

Задача M28.6.

3

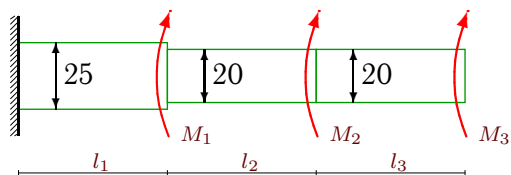


$$M_1 = 22 \text{ кНм}, M_2 = 9 \text{ кНм}, M_3 = 7 \text{ кНм},$$

$$l_1 = 2.6 \text{ м}, l_2 = 3.2 \text{ м}, l_3 = 2.8 \text{ м}.$$

Задача M28.7.

3

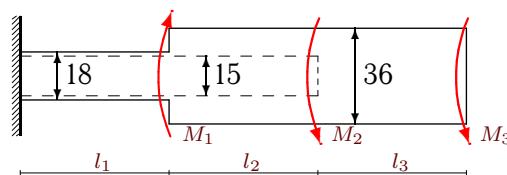


$$M_1 = 16 \text{ кНм}, M_2 = 12 \text{ кНм}, M_3 = 56 \text{ кНм},$$

$$l_1 = 2.6 \text{ м}, l_2 = 2.6 \text{ м}, l_3 = 2.2 \text{ м}.$$

Задача M28.8.

3

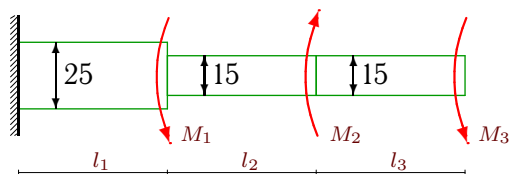


$$M_1 = 39 \text{ кНм}, M_2 = 45 \text{ кНм}, M_3 = 35 \text{ кНм},$$

$$l_1 = 2.4 \text{ м}, l_2 = 3.6 \text{ м}, l_3 = 4 \text{ м}.$$

Задача M28.9.

3

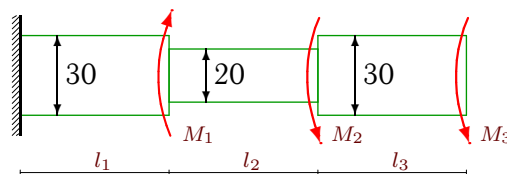


$$M_1 = 30 \text{ кНм}, M_2 = 56 \text{ кНм}, M_3 = 44 \text{ кНм},$$

$$l_1 = 4 \text{ м}, l_2 = 2.2 \text{ м}, l_3 = 3.8 \text{ м}.$$

Задача M28.10.

3

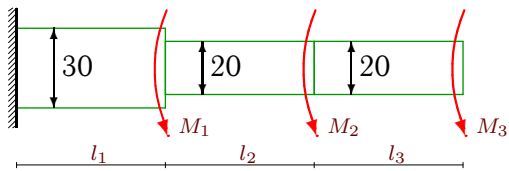


$$M_1 = 15 \text{ кНм}, M_2 = 70 \text{ кНм}, M_3 = 52 \text{ кНм},$$

$$l_1 = 2.8 \text{ м}, l_2 = 4 \text{ м}, l_3 = 3.8 \text{ м}.$$

Задача M28.11.

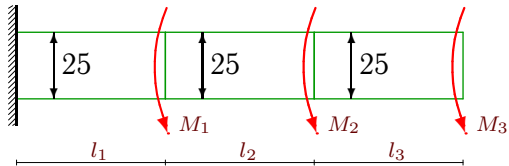
3



$M_1=70\text{кНм}$, $M_2=56\text{кНм}$, $M_3=32\text{кНм}$,
 $l_1=4\text{м}$, $l_2=3.8\text{м}$, $l_3=3.8\text{м}$.

Задача M28.13.

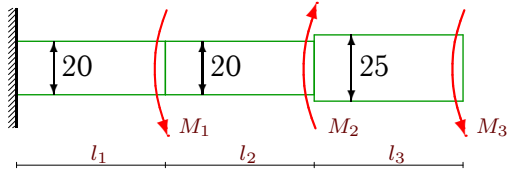
3



$M_1=36\text{кНм}$, $M_2=30\text{кНм}$, $M_3=40\text{кНм}$,
 $l_1=3.6\text{м}$, $l_2=3.4\text{м}$, $l_3=4\text{м}$.

Задача M28.15.

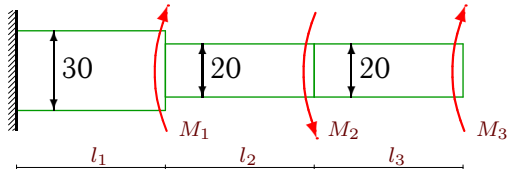
3



$M_1=7\text{кНм}$, $M_2=39\text{кНм}$, $M_3=39\text{кНм}$,
 $l_1=3\text{м}$, $l_2=2.4\text{м}$, $l_3=3.6\text{м}$.

Задача M28.17.

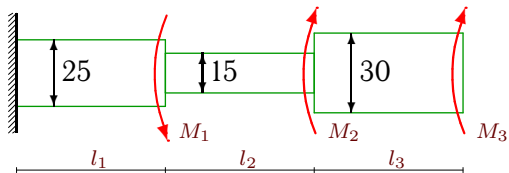
3



$M_1=11\text{кНм}$, $M_2=7\text{кНм}$, $M_3=36\text{кНм}$,
 $l_1=2.8\text{м}$, $l_2=3.2\text{м}$, $l_3=2.4\text{м}$.

Задача M28.19.

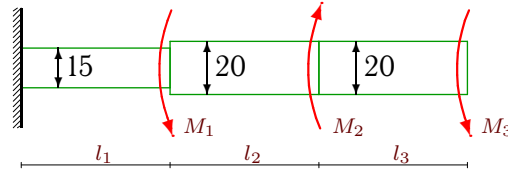
3



$M_1=28\text{кНм}$, $M_2=18\text{кНм}$, $M_3=32\text{кНм}$,
 $l_1=3.8\text{м}$, $l_2=2.4\text{м}$, $l_3=2.2\text{м}$.

Задача M28.12.

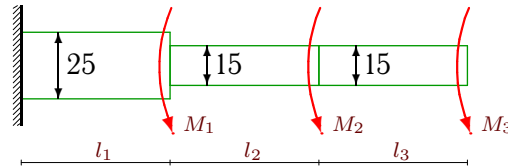
3



$M_1=40\text{кНм}$, $M_2=20\text{кНм}$, $M_3=7\text{кНм}$,
 $l_1=4\text{м}$, $l_2=2.6\text{м}$, $l_3=3\text{м}$.

Задача M28.14.

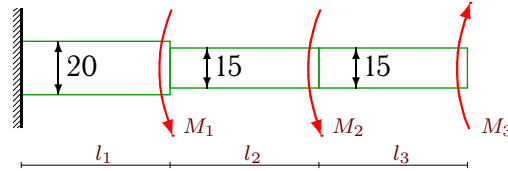
3



$M_1=45\text{кНм}$, $M_2=75\text{кНм}$, $M_3=55\text{кНм}$,
 $l_1=3.6\text{м}$, $l_2=4\text{м}$, $l_3=4\text{м}$.

Задача M28.16.

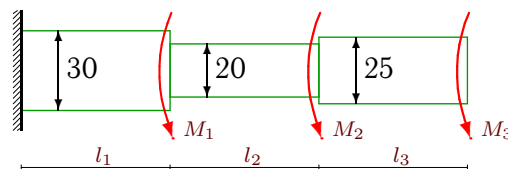
3



$M_1=50\text{кНм}$, $M_2=7\text{кНм}$, $M_3=28\text{кНм}$,
 $l_1=4\text{м}$, $l_2=3\text{м}$, $l_3=2.6\text{м}$.

Задача M28.18.

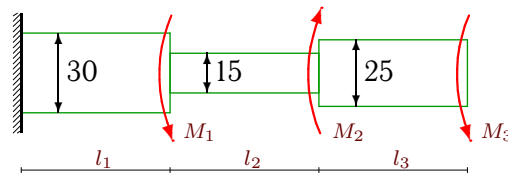
3



$M_1=50\text{кНм}$, $M_2=7\text{кНм}$, $M_3=20\text{кНм}$,
 $l_1=4\text{м}$, $l_2=3\text{м}$, $l_3=3.4\text{м}$.

Задача M28.20.

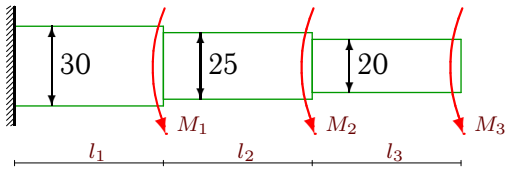
3



$M_1=7\text{кНм}$, $M_2=42\text{кНм}$, $M_3=56\text{кНм}$,
 $l_1=3.2\text{м}$, $l_2=2.4\text{м}$, $l_3=3.8\text{м}$.

Задача M28.21.

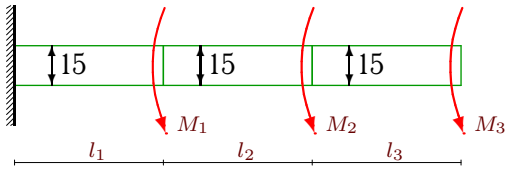
3



$M_1=15\text{кНм}$, $M_2=55\text{кНм}$, $M_3=10\text{кНм}$,
 $l_1=3.2\text{м}$, $l_2=4\text{м}$, $l_3=3.2\text{м}$.

Задача M28.23.

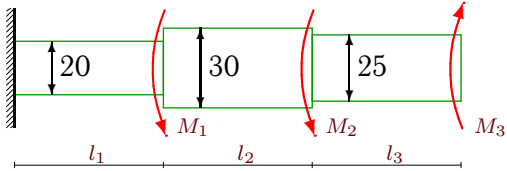
3



$M_1=26\text{кНм}$, $M_2=42\text{кНм}$, $M_3=36\text{кНм}$,
 $l_1=3.4\text{м}$, $l_2=3.6\text{м}$, $l_3=3.8\text{м}$.

Задача M28.25.

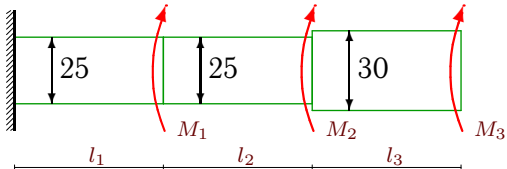
3



$M_1=7\text{кНм}$, $M_2=14\text{кНм}$, $M_3=27\text{кНм}$,
 $l_1=3\text{м}$, $l_2=3.4\text{м}$, $l_3=2.4\text{м}$.

Задача M28.27.

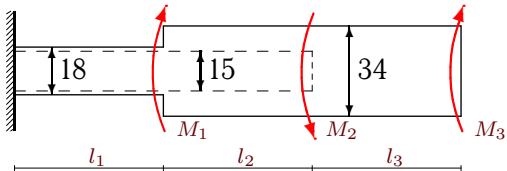
3



$M_1=6\text{кНм}$, $M_2=32\text{кНм}$, $M_3=12\text{кНм}$,
 $l_1=2.8\text{м}$, $l_2=2.2\text{м}$, $l_3=2.6\text{м}$.

Задача M28.29.

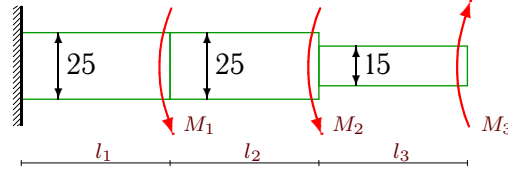
3



$M_1=36\text{кНм}$, $M_2=14\text{кНм}$, $M_3=30\text{кНм}$,
 $l_1=2.4\text{м}$, $l_2=3.4\text{м}$, $l_3=2.4\text{м}$.

Задача M28.22.

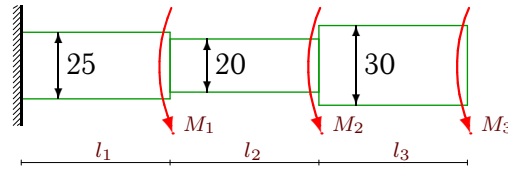
3



$M_1=55\text{кНм}$, $M_2=6\text{кНм}$, $M_3=28\text{кНм}$,
 $l_1=4\text{м}$, $l_2=3.2\text{м}$, $l_3=2.2\text{м}$.

Задача M28.24.

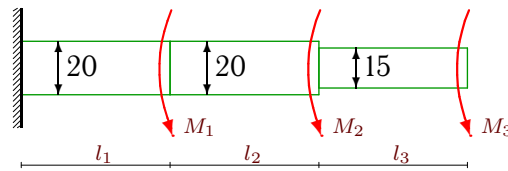
3



$M_1=7\text{кНм}$, $M_2=7\text{кНм}$, $M_3=56\text{кНм}$,
 $l_1=3\text{м}$, $l_2=3\text{м}$, $l_3=3.8\text{м}$.

Задача M28.26.

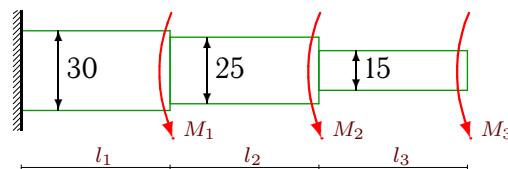
3



$M_1=20\text{кНм}$, $M_2=7\text{кНм}$, $M_3=24\text{кНм}$,
 $l_1=3.4\text{м}$, $l_2=3\text{м}$, $l_3=3.6\text{м}$.

Задача M28.28.

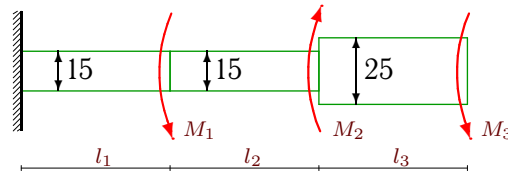
3



$M_1=44\text{кНм}$, $M_2=15\text{кНм}$, $M_3=70\text{кНм}$,
 $l_1=3.8\text{м}$, $l_2=3.2\text{м}$, $l_3=4\text{м}$.

Задача M28.30.

3



$M_1=9\text{кНм}$, $M_2=12\text{кНм}$, $M_3=28\text{кНм}$,
 $l_1=3.2\text{м}$, $l_2=2.8\text{м}$, $l_3=3.4\text{м}$.

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	0.675	1.006	1.210	22.491	11.695	6.791
2	-0.329	-0.595	-0.853	-11.734	-7.823	-11.734
3	-1.046	-1.084	0.125	-24.144	-1.273	25.465
4	2.260	4.091	7.914	45.200	39.235	60.361
5	8.466	15.407	15.478	149.393	104.123	2.641
6	-0.082	-0.061	-0.217	-3.773	0.652	-4.456
7	-0.712	-2.119	-3.099	-27.380	-43.290	-35.651
8	2.305	2.530	2.636	69.154	3.752	3.821
9	0.235	-0.429	3.776	5.867	-18.108	66.397
10	0.471	4.354	4.665	20.183	77.668	9.809
11	0.993	3.655	4.622	29.803	56.023	20.372
12	2.716	2.447	2.614	40.744	-8.276	4.456
13	1.244	2.020	2.541	34.551	22.816	13.038
14	2.053	15.132	20.665	57.041	196.173	82.996
15	0.167	0.167	0.625	4.456	0.000	12.712
16	0.923	-0.661	-2.492	18.462	-31.690	-42.253
17	-0.176	-0.915	-1.602	-7.545	-18.462	-22.918
18	0.484	1.129	1.350	14.524	17.189	6.519
19	-0.272	-3.291	-3.401	-7.171	-75.451	-6.036
20	0.106	0.951	1.644	3.961	21.126	18.253
21	0.402	1.250	1.505	15.090	21.187	6.366
22	0.430	0.201	-1.348	10.756	-7.171	-42.253
23	8.893	15.955	19.396	156.939	117.704	54.325
24	0.684	2.189	2.523	22.816	40.107	10.563
25	-0.143	-0.213	-0.424	-3.820	-2.452	-8.801
26	1.380	2.120	4.293	32.468	19.735	36.217
27	-0.456	-0.772	-0.821	-16.297	-14.342	-2.264
28	0.771	1.657	8.699	24.333	27.706	105.632
29	-2.924	-2.977	-3.046	-87.708	-0.951	-3.887
30	2.012	3.139	3.449	37.726	24.144	9.127

М28 файл о28m3A