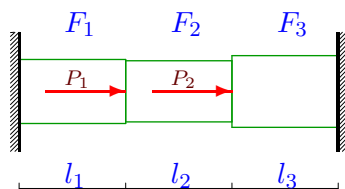


Напряженное состояние зажатого бруса

Найти реакции опор стального прямого призматического бруса кусочно-постоянного сечения, закрепленного по концам. К брусу приложены силы P_1 , P_2 . Построить эпюры продольных сил, нормальных напряжений, относительных удлинений и горизонтальных смещений. Модуль упругости материала $E = 2 \cdot 10^5$ МПа.

Задача 17.1.



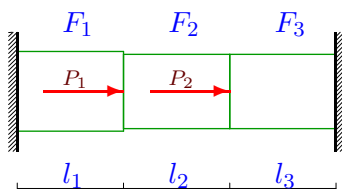
$$P_1 = 105 \text{ кН}, P_2 = 77 \text{ кН},$$

$$F_1 = 24 \text{ см}^2, F_2 = 23 \text{ см}^2,$$

$$F_3 = 27 \text{ см}^2,$$

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

Задача 17.2.



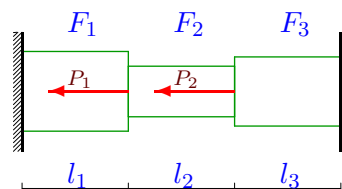
$$P_1 = 111 \text{ кН}, P_2 = 64 \text{ кН},$$

$$F_1 = 30 \text{ см}^2, F_2 = 28 \text{ см}^2,$$

$$F_3 = 28 \text{ см}^2,$$

$$l_1 = 3 \text{ м}, l_2 = 3 \text{ м}, l_3 = 2 \text{ м}.$$

Задача 17.3.



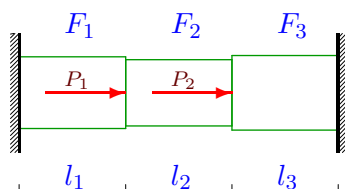
$$P_1 = 32 \text{ кН}, P_2 = 114 \text{ кН},$$

$$F_1 = 30 \text{ см}^2, F_2 = 19 \text{ см}^2,$$

$$F_3 = 26 \text{ см}^2,$$

$$l_1 = 2 \text{ м}, l_2 = 2 \text{ м}, l_3 = 3 \text{ м}.$$

Задача 17.4.



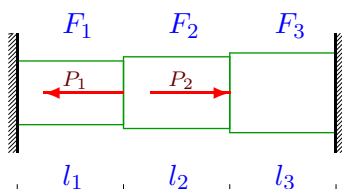
$$P_1 = 190 \text{ кН}, P_2 = 99 \text{ кН},$$

$$F_1 = 27 \text{ см}^2, F_2 = 25 \text{ см}^2,$$

$$F_3 = 28 \text{ см}^2,$$

$$l_1 = 4 \text{ м}, l_2 = 3 \text{ м}, l_3 = 2 \text{ м}.$$

Задача 17.5.



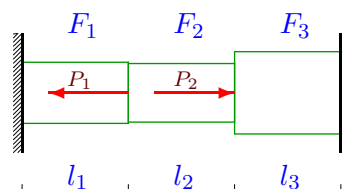
$$P_1 = 39 \text{ кН}, P_2 = 124 \text{ кН},$$

$$F_1 = 24 \text{ см}^2, F_2 = 27 \text{ см}^2,$$

$$F_3 = 30 \text{ см}^2,$$

$$l_1 = 2 \text{ м}, l_2 = 3 \text{ м}, l_3 = 2 \text{ м}.$$

Задача 17.6.



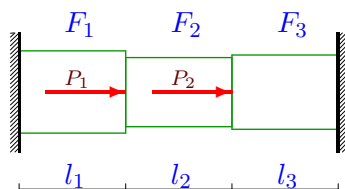
$$P_1 = 35 \text{ кН}, P_2 = 77 \text{ кН},$$

$$F_1 = 23 \text{ см}^2, F_2 = 22 \text{ см}^2,$$

$$F_3 = 31 \text{ см}^2,$$

$$l_1 = 2 \text{ м}, l_2 = 3 \text{ м}, l_3 = 3 \text{ м}.$$

Задача 17.7.



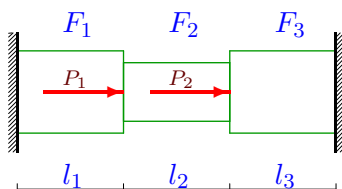
$$P_1 = 144 \text{ кН}, P_2 = 31 \text{ кН},$$

$$F_1 = 31 \text{ см}^2, F_2 = 26 \text{ см}^2,$$

$$F_3 = 28 \text{ см}^2,$$

$$l_1 = 3 \text{ м}, l_2 = 3 \text{ м}, l_3 = 2 \text{ м}.$$

Задача 17.8.



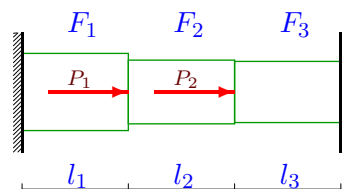
$$P_1 = 144 \text{ кН}, P_2 = 33 \text{ кН},$$

$$F_1 = 31 \text{ см}^2, F_2 = 22 \text{ см}^2,$$

$$F_3 = 31 \text{ см}^2,$$

$$l_1 = 3 \text{ м}, l_2 = 3 \text{ м}, l_3 = 2 \text{ м}.$$

Задача 17.9.



$$P_1 = 77 \text{ кН}, P_2 = 117 \text{ кН},$$

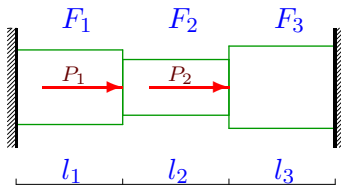
$$F_1 = 29 \text{ см}^2, F_2 = 24 \text{ см}^2,$$

$$F_3 = 23 \text{ см}^2,$$

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

Задача 17.10.

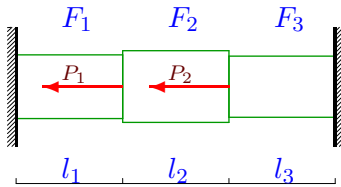
3



$P_1 = 72\text{кН}, P_2 = 38\text{кН},$
 $F_1 = 28\text{см}^2, F_2 = 21\text{см}^2,$
 $F_3 = 31\text{см}^2,$
 $l_1 = 3\text{м}, l_2 = 3\text{м}, l_3 = 3\text{м}.$

Задача 17.13.

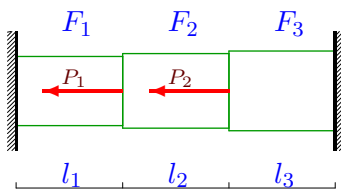
3



$P_1 = 62\text{кН}, P_2 = 124\text{кН},$
 $F_1 = 24\text{см}^2, F_2 = 27\text{см}^2,$
 $F_3 = 23\text{см}^2,$
 $l_1 = 2\text{м}, l_2 = 2\text{м}, l_3 = 2\text{м}.$

Задача 17.16.

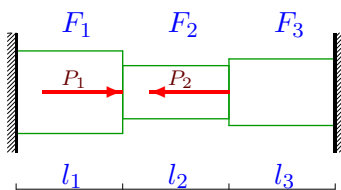
3



$P_1 = 64\text{кН}, P_2 = 96\text{кН},$
 $F_1 = 26\text{см}^2, F_2 = 28\text{см}^2,$
 $F_3 = 30\text{см}^2,$
 $l_1 = 2\text{м}, l_2 = 2\text{м}, l_3 = 2\text{м}.$

Задача 17.19.

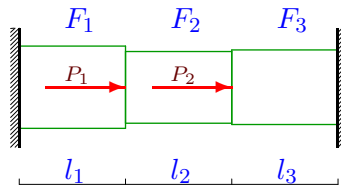
3



$P_1 = 99\text{кН}, P_2 = 68\text{кН},$
 $F_1 = 31\text{см}^2, F_2 = 20\text{см}^2,$
 $F_3 = 25\text{см}^2,$
 $l_1 = 3\text{м}, l_2 = 2\text{м}, l_3 = 2\text{м}.$

Задача 17.11.

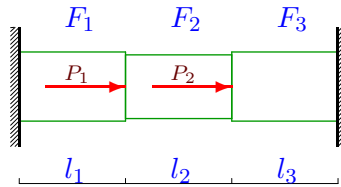
3



$P_1 = 78\text{кН}, P_2 = 136\text{кН},$
 $F_1 = 31\text{см}^2, F_2 = 27\text{см}^2,$
 $F_3 = 28\text{см}^2,$
 $l_1 = 3\text{м}, l_2 = 3\text{м}, l_3 = 2\text{м}.$

Задача 17.14.

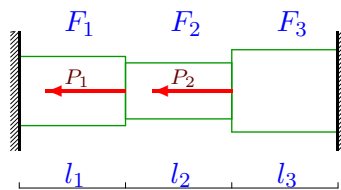
3



$P_1 = 77\text{кН}, P_2 = 180\text{кН},$
 $F_1 = 26\text{см}^2, F_2 = 24\text{см}^2,$
 $F_3 = 26\text{см}^2,$
 $l_1 = 3\text{м}, l_2 = 4\text{м}, l_3 = 3\text{м}.$

Задача 17.17.

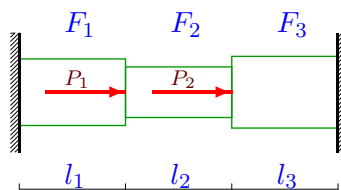
3



$P_1 = 31\text{кН}, P_2 = 124\text{кН},$
 $F_1 = 26\text{см}^2, F_2 = 21\text{см}^2,$
 $F_3 = 31\text{см}^2,$
 $l_1 = 2\text{м}, l_2 = 2\text{м}, l_3 = 2\text{м}.$

Задача 17.20.

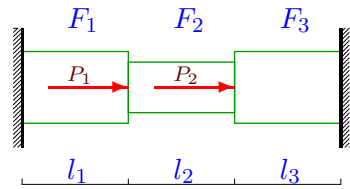
3



$P_1 = 185\text{кН}, P_2 = 68\text{кН},$
 $F_1 = 25\text{см}^2, F_2 = 19\text{см}^2,$
 $F_3 = 27\text{см}^2,$
 $l_1 = 4\text{м}, l_2 = 3\text{м}, l_3 = 2\text{м}.$

Задача 17.12.

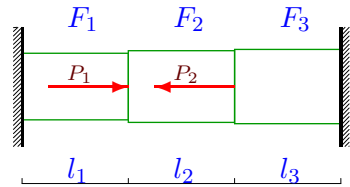
3



$P_1 = 77\text{кН}, P_2 = 36\text{кН},$
 $F_1 = 27\text{см}^2, F_2 = 19\text{см}^2,$
 $F_3 = 27\text{см}^2,$
 $l_1 = 3\text{м}, l_2 = 3\text{м}, l_3 = 3\text{м}.$

Задача 17.15.

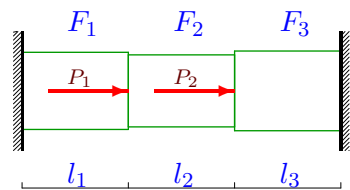
3



$P_1 = 68\text{кН}, P_2 = 34\text{кН},$
 $F_1 = 25\text{см}^2, F_2 = 27\text{см}^2,$
 $F_3 = 28\text{см}^2,$
 $l_1 = 3\text{м}, l_2 = 2\text{м}, l_3 = 2\text{м}.$

Задача 17.18.

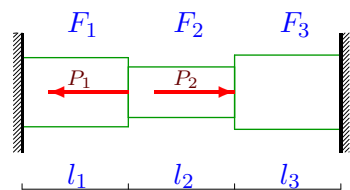
3



$P_1 = 39\text{кН}, P_2 = 136\text{кН},$
 $F_1 = 29\text{см}^2, F_2 = 27\text{см}^2,$
 $F_3 = 30\text{см}^2,$
 $l_1 = 3\text{м}, l_2 = 3\text{м}, l_3 = 2\text{м}.$

Задача 17.21.

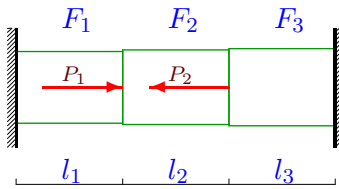
3



$P_1 = 70\text{кН}, P_2 = 77\text{кН},$
 $F_1 = 26\text{см}^2, F_2 = 19\text{см}^2,$
 $F_3 = 28\text{см}^2,$
 $l_1 = 2\text{м}, l_2 = 3\text{м}, l_3 = 3\text{м}.$

Задача 17.22.

3



$$P_1 = 96 \text{ кН}, P_2 = 108 \text{ кН},$$

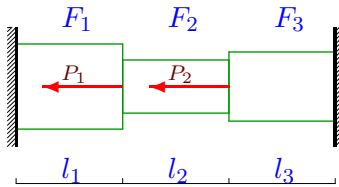
$$F_1 = 27 \text{ см}^2, F_2 = 28 \text{ см}^2,$$

$$F_3 = 29 \text{ см}^2,$$

$$l_1 = 3 \text{ м}, l_2 = 2 \text{ м}, l_3 = 3 \text{ м}.$$

Задача 17.25.

3



$$P_1 = 99 \text{ кН}, P_2 = 80 \text{ кН},$$

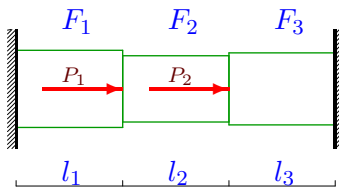
$$F_1 = 32 \text{ см}^2, F_2 = 20 \text{ см}^2,$$

$$F_3 = 26 \text{ см}^2,$$

$$l_1 = 2 \text{ м}, l_2 = 2 \text{ м}, l_3 = 4 \text{ м}.$$

Задача 17.28.

3



$$P_1 = 38 \text{ кН}, P_2 = 111 \text{ кН},$$

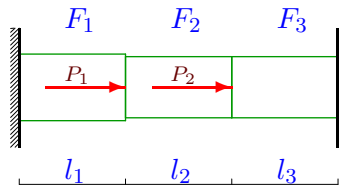
$$F_1 = 29 \text{ см}^2, F_2 = 25 \text{ см}^2,$$

$$F_3 = 27 \text{ см}^2,$$

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

Задача 17.23.

3



$$P_1 = 76 \text{ кН}, P_2 = 96 \text{ кН},$$

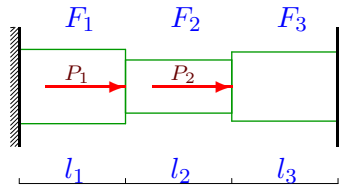
$$F_1 = 25 \text{ см}^2, F_2 = 23 \text{ см}^2,$$

$$F_3 = 23 \text{ см}^2,$$

$$l_1 = 3 \text{ м}, l_2 = 3 \text{ м}, l_3 = 2 \text{ м}.$$

Задача 17.26.

3



$$P_1 = 38 \text{ кН}, P_2 = 120 \text{ кН},$$

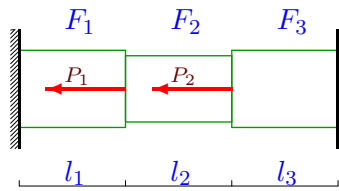
$$F_1 = 28 \text{ см}^2, F_2 = 20 \text{ см}^2,$$

$$F_3 = 26 \text{ см}^2,$$

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

Задача 17.29.

3



$$P_1 = 99 \text{ кН}, P_2 = 68 \text{ кН},$$

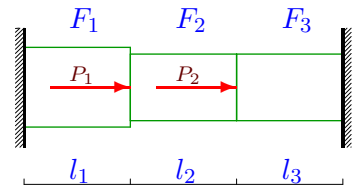
$$F_1 = 29 \text{ см}^2, F_2 = 25 \text{ см}^2,$$

$$F_3 = 29 \text{ см}^2,$$

$$l_1 = 2 \text{ м}, l_2 = 2 \text{ м}, l_3 = 2 \text{ м}.$$

Задача 17.24.

3



$$P_1 = 38 \text{ кН}, P_2 = 114 \text{ кН},$$

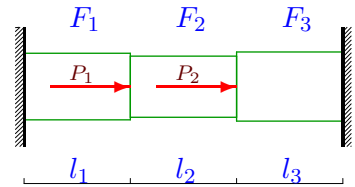
$$F_1 = 30 \text{ см}^2, F_2 = 25 \text{ см}^2,$$

$$F_3 = 25 \text{ см}^2,$$

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

Задача 17.27.

3



$$P_1 = 108 \text{ кН}, P_2 = 34 \text{ кН},$$

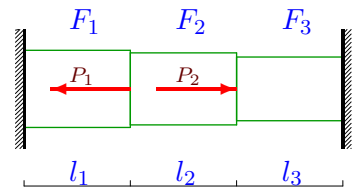
$$F_1 = 25 \text{ см}^2, F_2 = 23 \text{ см}^2,$$

$$F_3 = 26 \text{ см}^2,$$

$$l_1 = 3 \text{ м}, l_2 = 3 \text{ м}, l_3 = 2 \text{ м}.$$

Задача 17.30.

3



$$P_1 = 117 \text{ кН}, P_2 = 136 \text{ кН},$$

$$F_1 = 29 \text{ см}^2, F_2 = 27 \text{ см}^2,$$

$$F_3 = 24 \text{ см}^2,$$

$$l_1 = 2 \text{ м}, l_2 = 3 \text{ м}, l_3 = 2 \text{ м}.$$

Напряженное состояние зажатого бруса

№	R_A	δ_1	δ_2
	кН	мм	
1	100.744	0.630	0.602
2	87.564	0.438	0.312
3	-70.357	-0.235	-0.436
4	127.932	0.948	0.575
5	5.106	0.021	0.266
6	-2.213	-0.010	0.214
7	102.668	0.497	0.258
8	104.335	0.505	0.234
9	97.328	0.503	0.630
10	60.359	0.323	0.240
11	85.754	0.415	0.458
12	65.015	0.361	0.267
13	-84.982	-0.354	-0.439
14	106.903	0.617	0.866
15	28.119	0.169	0.021
16	-70.869	-0.273	-0.297
17	-54.726	-0.210	-0.323
18	56.894	0.294	0.394
19	44.730	0.216	-0.055
20	122.334	0.979	0.484
21	-30.128	-0.116	0.199
22	19.636	0.109	-0.164
23	73.711	0.442	0.427
24	67.059	0.335	0.510
25	-118.347	-0.370	-0.467
26	73.013	0.391	0.654
27	76.400	0.458	0.252
28	63.115	0.326	0.477
29	-89.190	-0.308	-0.268
30	-43.342	-0.149	0.260