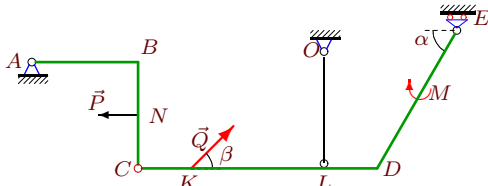


## Составная конструкция

Определить реакции опор конструкции (в кН), состоящей из двух тел. Конструкция расположена в вертикальной плоскости. Дан погонный вес  $\rho$ .

### Задача S7.1.

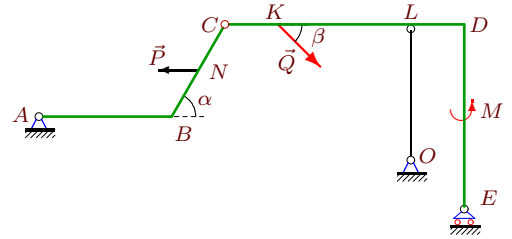
5



$P = 6$  кН,  $Q = 7$  кН,  $M = 6$  кНм,  
 $\rho = 2$  кН/м,  $\alpha = 60^\circ$ ,  $\beta = 45^\circ$ ,  
 $AB = 4$  м,  $BC = 4$  м,  $CD = 9$  м,  
 $DE = 6$  м,  $CN = 2$  м,  $CK = 2$  м.  $LD = 2$  м

### Задача S7.2.

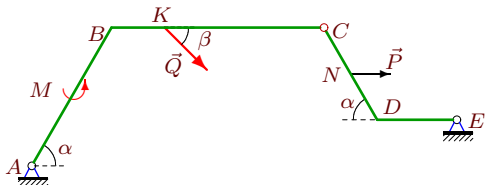
5



$P = 6$  кН,  $Q = 1$  кН,  $M = 5$  кНм,  
 $\rho = 2$  кН/м,  $\alpha = 60^\circ$ ,  $\beta = 45^\circ$ ,  
 $AB = 5$  м,  $BC = 4$  м,  $CD = 9$  м,  
 $DE = 7$  м,  $CN = 2$  м,  $CK = 2$  м.  $LD = 2$  м

### Задача S7.3.

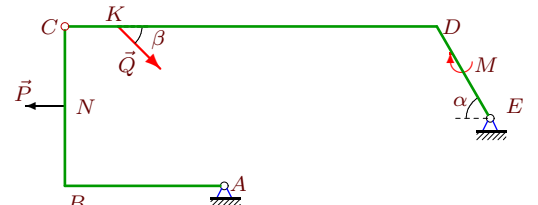
5



$P = 5$  кН,  $Q = 6$  кН,  $M = 5$  кНм,  
 $\rho = 1$  кН/м,  $\alpha = 60^\circ$ ,  $\beta = 45^\circ$ ,  
 $AB = 6$  м,  $BC = 8$  м,  $CD = 4$  м,  
 $DE = 3$  м,  $CN = 2$  м,  $BK = 2$  м.

### Задача S7.4.

5



$P = 5$  кН,  $Q = 9$  кН,  $M = 3$  кНм,  
 $\rho = 1$  кН/м,  $\alpha = 60^\circ$ ,  $\beta = 45^\circ$ ,  
 $AB = 6$  м,  $BC = 6$  м,  $CD = 14$  м,  
 $DE = 4$  м,  $CN = 3$  м,  $CK = 2$  м.

### Задача S7.5.

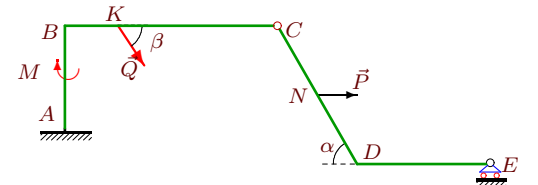
5



$P = 7$  кН,  $Q = 4$  кН,  $M = 3$  кНм,  
 $\rho = 1$  кН/м,  $\alpha = 60^\circ$ ,  $\beta = 75^\circ$ ,  
 $AB = 4$  м,  $BC = 12$  м,  $CD = 4$  м,  
 $DE = 5$  м,  $CN = 2$  м,  $BK = 3$  м.

### Задача S7.6.

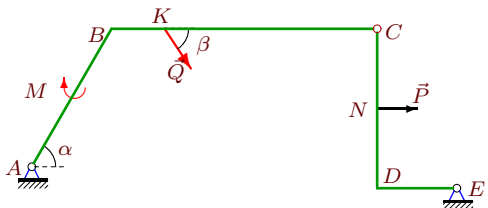
5



$P = 8$  кН,  $Q = 8$  кН,  $M = 9$  кНм,  
 $\rho = 3$  кН/м,  $\alpha = 60^\circ$ ,  $\beta = 60^\circ$ ,  
 $AB = 4$  м,  $BC = 8$  м,  $CD = 6$  м,  
 $DE = 5$  м,  $CN = 3$  м,  $BK = 2$  м.

### Задача S7.7.

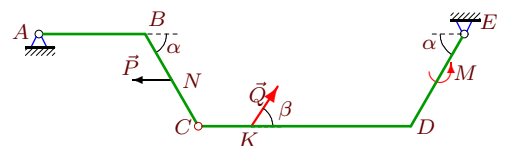
5



$P = 6$  кН,  $Q = 2$  кН,  $M = 3$  кНм,  
 $\rho = 1$  кН/м,  $\alpha = 60^\circ$ ,  $\beta = 60^\circ$ ,  
 $AB = 6$  м,  $BC = 10$  м,  $CD = 6$  м,  
 $DE = 3$  м,  $CN = 3$  м,  $BK = 2$  м.

### Задача S7.8.

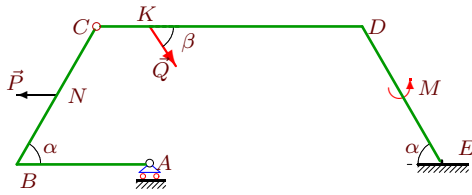
5



$P = 7$  кН,  $Q = 6$  кН,  $M = 9$  кНм,  
 $\rho = 1$  кН/м,  $\alpha = 60^\circ$ ,  $\beta = 75^\circ$ ,  
 $AB = 4$  м,  $BC = 4$  м,  $CD = 8$  м,  
 $DE = 4$  м,  $CN = 2$  м,  $CK = 2$  м.

**Задача S7.9.**

5



$P = 9 \text{ кН}, Q = 5 \text{ кН}, M = 9 \text{ кНм},$   
 $\rho = 3 \text{ кН/м}, \alpha = 60^\circ, \beta = 75^\circ,$   
 $AB = 5 \text{ м}, BC = 6 \text{ м}, CD = 10 \text{ м},$   
 $DE = 6 \text{ м}, CN = 3 \text{ м}, CK = 2 \text{ м}.$

**Задача S7.11.**

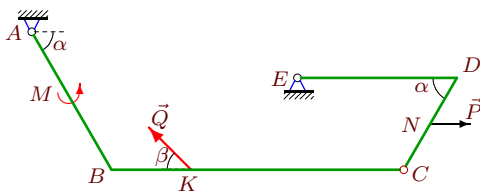
5



$P = 7 \text{ кН}, Q = 7 \text{ кН}, M = 5 \text{ кНм},$   
 $\rho = 3 \text{ кН/м}, \alpha = 60^\circ, \beta = 45^\circ,$   
 $AB = 4 \text{ м}, BC = 14 \text{ м}, CD = 4 \text{ м},$   
 $DE = 4 \text{ м}, CN = 2 \text{ м}, BK = 3 \text{ м}.$

**Задача S7.13.**

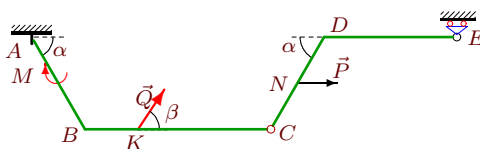
5



$P = 4 \text{ кН}, Q = 5 \text{ кН}, M = 3 \text{ кНм},$   
 $\rho = 1 \text{ кН/м}, \alpha = 60^\circ, \beta = 30^\circ,$   
 $AB = 6 \text{ м}, BC = 11 \text{ м}, CD = 4 \text{ м},$   
 $DE = 6 \text{ м}, CN = 2 \text{ м}, BK = 3 \text{ м}.$

**Задача S7.15.**

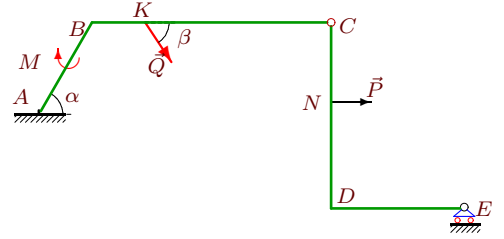
5



$P = 9 \text{ кН}, Q = 4 \text{ кН}, M = 9 \text{ кНм},$   
 $\rho = 3 \text{ кН/м}, \alpha = 60^\circ, \beta = 75^\circ,$   
 $AB = 4 \text{ м}, BC = 7 \text{ м}, CD = 4 \text{ м},$   
 $DE = 5 \text{ м}, CN = 2 \text{ м}, BK = 2 \text{ м}.$

**Задача S7.10.**

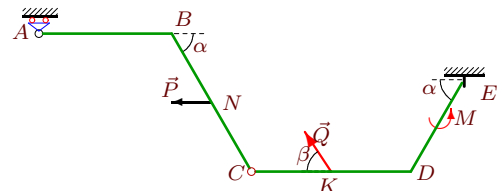
5



$P = 8 \text{ кН}, Q = 1 \text{ кН}, M = 9 \text{ кНм},$   
 $\rho = 3 \text{ кН/м}, \alpha = 60^\circ, \beta = 60^\circ,$   
 $AB = 4 \text{ м}, BC = 9 \text{ м}, CD = 7 \text{ м},$   
 $DE = 5 \text{ м}, CN = 3 \text{ м}, BK = 2 \text{ м}.$

**Задача S7.12.**

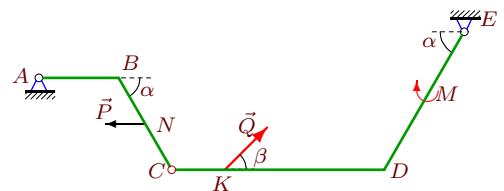
5



$P = 9 \text{ кН}, Q = 3 \text{ кН}, M = 9 \text{ кНм},$   
 $\rho = 3 \text{ кН/м}, \alpha = 60^\circ, \beta = 75^\circ,$   
 $AB = 5 \text{ м}, BC = 6 \text{ м}, CD = 6 \text{ м},$   
 $DE = 4 \text{ м}, CN = 3 \text{ м}, CK = 3 \text{ м}.$

**Задача S7.14.**

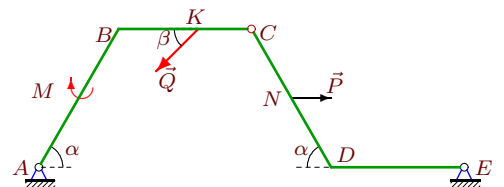
5



$P = 4 \text{ кН}, Q = 5 \text{ кН}, M = 3 \text{ кНм},$   
 $\rho = 1 \text{ кН/м}, \alpha = 60^\circ, \beta = 30^\circ,$   
 $AB = 3 \text{ м}, BC = 4 \text{ м}, CD = 8 \text{ м},$   
 $DE = 6 \text{ м}, CN = 2 \text{ м}, CK = 2 \text{ м}.$

**Задача S7.16.**

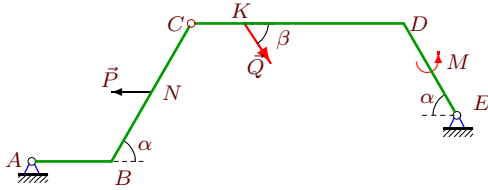
5



$P = 5 \text{ кН}, Q = 4 \text{ кН}, M = 3 \text{ кНм},$   
 $\rho = 1 \text{ кН/м}, \alpha = 60^\circ, \beta = 45^\circ,$   
 $AB = 6 \text{ м}, BC = 5 \text{ м}, CD = 6 \text{ м},$   
 $DE = 5 \text{ м}, CN = 3 \text{ м}, BK = 3 \text{ м}.$

**Задача S7.17.**

5



$P = 7 \text{ кН}$ ,  $Q = 6 \text{ кН}$ ,  $M = 9 \text{ кНм}$ ,  
 $\rho = 1 \text{ кН/м}$ ,  $\alpha = 60^\circ$ ,  $\beta = 75^\circ$ ,  
 $AB = 3 \text{ м}$ ,  $BC = 6 \text{ м}$ ,  $CD = 8 \text{ м}$ ,  
 $DE = 4 \text{ м}$ ,  $CN = 3 \text{ м}$ ,  $CK = 2 \text{ м}$ .

**Задача S7.19.**

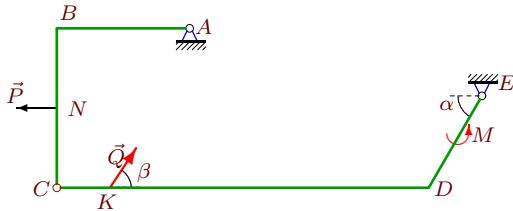
5



$P = 6 \text{ кН}$ ,  $Q = 2 \text{ кН}$ ,  $M = 3 \text{ кНм}$ ,  
 $\rho = 3 \text{ кН/м}$ ,  $\alpha = 60^\circ$ ,  $\beta = 30^\circ$ ,  
 $AB = 5 \text{ м}$ ,  $BC = 4 \text{ м}$ ,  $CD = 14 \text{ м}$ ,  
 $DE = 4 \text{ м}$ ,  $CN = 2 \text{ м}$ ,  $CK = 2 \text{ м}$ .

**Задача S7.21.**

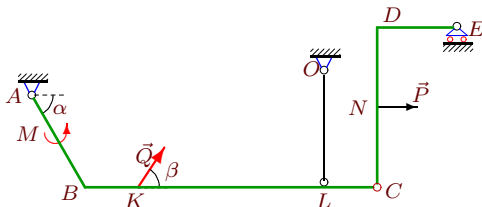
5



$P = 6 \text{ кН}$ ,  $Q = 7 \text{ кН}$ ,  $M = 7 \text{ кНм}$ ,  
 $\rho = 1 \text{ кН/м}$ ,  $\alpha = 60^\circ$ ,  $\beta = 60^\circ$ ,  
 $AB = 5 \text{ м}$ ,  $BC = 6 \text{ м}$ ,  $CD = 14 \text{ м}$ ,  
 $DE = 4 \text{ м}$ ,  $CN = 3 \text{ м}$ ,  $CK = 2 \text{ м}$ .

**Задача S7.23.**

5



$P = 7 \text{ кН}$ ,  $Q = 2 \text{ кН}$ ,  $M = 7 \text{ кНм}$ ,  
 $\rho = 2 \text{ кН/м}$ ,  $\alpha = 60^\circ$ ,  $\beta = 60^\circ$ ,  
 $AB = 4 \text{ м}$ ,  $BC = 11 \text{ м}$ ,  $CD = 6 \text{ м}$ ,  
 $DE = 3 \text{ м}$ ,  $CN = 3 \text{ м}$ ,  $BK = 2 \text{ м}$ ,  $LC = 2 \text{ м}$ .

**Задача S7.18.**

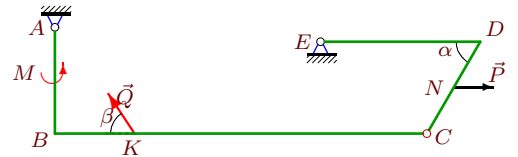
5



$P = 9 \text{ кН}$ ,  $Q = 5 \text{ кН}$ ,  $M = 9 \text{ кНм}$ ,  
 $\rho = 3 \text{ кН/м}$ ,  $\alpha = 60^\circ$ ,  $\beta = 75^\circ$ ,  
 $AB = 5 \text{ м}$ ,  $BC = 4 \text{ м}$ ,  $CD = 12 \text{ м}$ ,  
 $DE = 4 \text{ м}$ ,  $CN = 2 \text{ м}$ ,  $CK = 2 \text{ м}$ .

**Задача S7.20.**

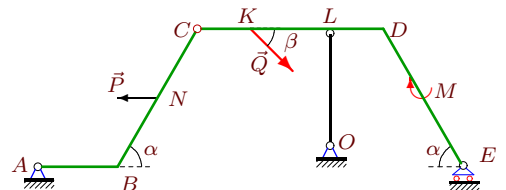
5



$P = 7 \text{ кН}$ ,  $Q = 7 \text{ кН}$ ,  $M = 9 \text{ кНм}$ ,  
 $\rho = 1 \text{ кН/м}$ ,  $\alpha = 60^\circ$ ,  $\beta = 75^\circ$ ,  
 $AB = 4 \text{ м}$ ,  $BC = 14 \text{ м}$ ,  $CD = 4 \text{ м}$ ,  
 $DE = 6 \text{ м}$ ,  $CN = 2 \text{ м}$ ,  $BK = 3 \text{ м}$ .

**Задача S7.22.**

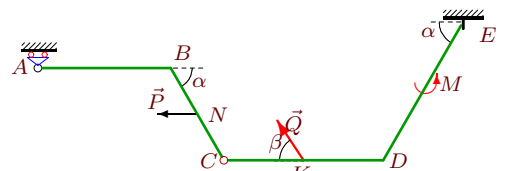
5



$P = 5 \text{ кН}$ ,  $Q = 5 \text{ кН}$ ,  $M = 6 \text{ кНм}$ ,  
 $\rho = 2 \text{ кН/м}$ ,  $\alpha = 60^\circ$ ,  $\beta = 30^\circ$ ,  
 $AB = 3 \text{ м}$ ,  $BC = 6 \text{ м}$ ,  $CD = 7 \text{ м}$ ,  
 $DE = 6 \text{ м}$ ,  $CN = 3 \text{ м}$ ,  $CK = 2 \text{ м}$ ,  $LD = 2 \text{ м}$ .

**Задача S7.24.**

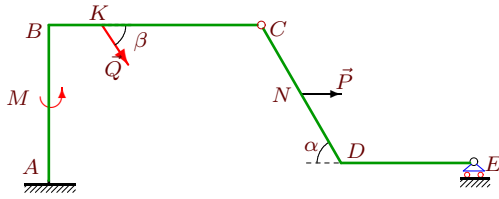
5



$P = 8 \text{ кН}$ ,  $Q = 5 \text{ кН}$ ,  $M = 7 \text{ кНм}$ ,  
 $\rho = 3 \text{ кН/м}$ ,  $\alpha = 60^\circ$ ,  $\beta = 60^\circ$ ,  
 $AB = 5 \text{ м}$ ,  $BC = 4 \text{ м}$ ,  $CD = 6 \text{ м}$ ,  
 $DE = 6 \text{ м}$ ,  $CN = 2 \text{ м}$ ,  $CK = 3 \text{ м}$ .

**Задача S7.25.**

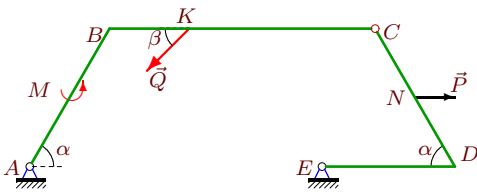
5



$P = 8 \text{ кН}, Q = 8 \text{ кН}, M = 7 \text{ кНм},$   
 $\rho = 3 \text{ кН/м}, \alpha = 60^\circ, \beta = 60^\circ,$   
 $AB = 6 \text{ м}, BC = 8 \text{ м}, CD = 6 \text{ м},$   
 $DE = 5 \text{ м}, CN = 3 \text{ м}, BK = 2 \text{ м}.$

**Задача S7.27.**

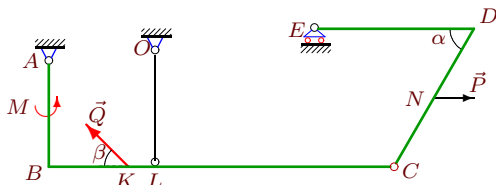
5



$P = 5 \text{ кН}, Q = 5 \text{ кН}, M = 5 \text{ кНм},$   
 $\rho = 1 \text{ кН/м}, \alpha = 60^\circ, \beta = 45^\circ,$   
 $AB = 6 \text{ м}, BC = 10 \text{ м}, CD = 6 \text{ м},$   
 $DE = 5 \text{ м}, CN = 3 \text{ м}, BK = 3 \text{ м}.$

**Задача S7.29.**

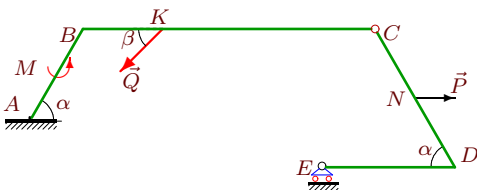
5



$P = 5 \text{ кН}, Q = 7 \text{ кН}, M = 3 \text{ кНм},$   
 $\rho = 2 \text{ кН/м}, \alpha = 60^\circ, \beta = 30^\circ,$   
 $AB = 4 \text{ м}, BC = 13 \text{ м}, CD = 6 \text{ м},$   
 $DE = 6 \text{ м}, CN = 3 \text{ м}, BK = 3 \text{ м}. LC = 9 \text{ м}.$

**Задача S7.31.**

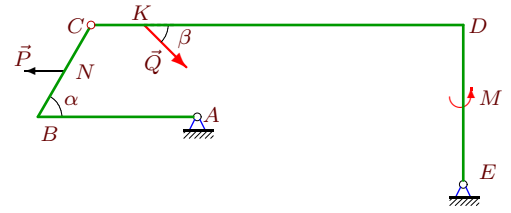
5



$P = 7 \text{ кН}, Q = 3 \text{ кН}, M = 5 \text{ кНм},$   
 $\rho = 3 \text{ кН/м}, \alpha = 60^\circ, \beta = 45^\circ,$   
 $AB = 4 \text{ м}, BC = 11 \text{ м}, CD = 6 \text{ м},$   
 $DE = 5 \text{ м}, CN = 3 \text{ м}, BK = 3 \text{ м}.$

**Задача S7.26.**

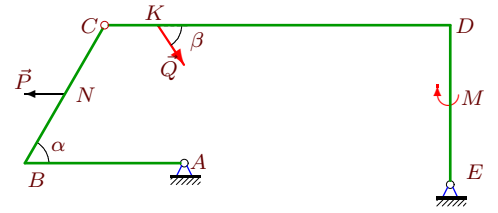
5



$P = 5 \text{ кН}, Q = 1 \text{ кН}, M = 5 \text{ кНм},$   
 $\rho = 1 \text{ кН/м}, \alpha = 60^\circ, \beta = 45^\circ,$   
 $AB = 6 \text{ м}, BC = 4 \text{ м}, CD = 14 \text{ м},$   
 $DE = 6 \text{ м}, CN = 2 \text{ м}, CK = 2 \text{ м}.$

**Задача S7.28.**

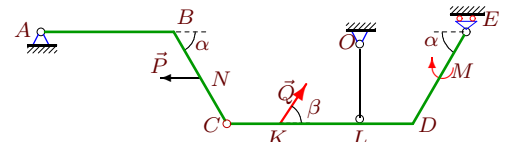
5



$P = 6 \text{ кН}, Q = 2 \text{ кН}, M = 3 \text{ кНм},$   
 $\rho = 1 \text{ кН/м}, \alpha = 60^\circ, \beta = 60^\circ,$   
 $AB = 6 \text{ м}, BC = 6 \text{ м}, CD = 13 \text{ м},$   
 $DE = 6 \text{ м}, CN = 3 \text{ м}, CK = 2 \text{ м}.$

**Задача S7.30.**

5



$P = 7 \text{ кН}, Q = 4 \text{ кН}, M = 6 \text{ кНм},$   
 $\rho = 2 \text{ кН/м}, \alpha = 60^\circ, \beta = 60^\circ,$   
 $AB = 5 \text{ м}, BC = 4 \text{ м}, CD = 7 \text{ м},$   
 $DE = 4 \text{ м}, CN = 2 \text{ м}, CK = 2 \text{ м}. LD = 2 \text{ м}.$

**Задача S7.32.**

5



$P = 7 \text{ кН}, Q = 6 \text{ кН}, M = 5 \text{ кНм},$   
 $\rho = 3 \text{ кН/м}, \alpha = 60^\circ, \beta = 45^\circ,$   
 $AB = 5 \text{ м}, BC = 4 \text{ м}, CD = 12 \text{ м},$   
 $DE = 4 \text{ м}, CN = 2 \text{ м}, CK = 2 \text{ м}.$

**S7 Ответы.**  
**Составная конструкция**

04.03.2012

	$X_A$	$Y_A$	$X_E$	$Y_E$	$S_{OL}$	$M$
1	1.050	5.950	—	-8.521	43.621	
2	5.293	8.706	—	-45.296	87.297	
3	5.846	13.621	-15.088	11.622	—	
4	-25.157	30.657	23.793	5.707	—	
5	13.922	2.714	-19.887	18.422	—	
6	-12.000	64.839	—	11.089	—	342.141
7	3.018	11.195	-10.018	15.537	—	
8	-2.406	6.743	7.853	7.461	—	
9	—	-5.559	7.706	91.388	—	-870.430
10	-8.500	73.166	—	2.700	—	595.709
11	-2.050	85.112	—	-12.062	—	770.820
12	—	16.610	9.776	43.492	—	-193.762
13	35.471	-4.701	-35.141	29.201	—	
14	-5.545	8.127	5.215	10.373	—	
15	-10.035	42.552	—	13.584	—	207.025
16	10.554	13.624	-12.725	11.204	—	
17	17.242	15.651	-11.795	11.145	—	
18	—	-6.696	7.706	76.867	—	-696.097
19	—	-4.964	4.268	84.964	—	-715.426
20	22.309	-0.044	-27.497	21.282	—	
21	15.066	16.979	-12.566	5.959	—	
22	0.670	5.915	—	-8.185	48.770	
23	-8.000	14.872	—	10.000	21.396	
24	—	13.337	10.500	45.333	—	-184.430
25	-12.000	70.839	—	11.089	—	350.141
26	-39.177	36.593	43.470	-5.886	—	
27	-10.077	7.414	8.613	23.121	—	
28	-15.621	29.252	20.621	3.480	—	
29	1.062	-86.680	—	-10.330	151.510	
30	5.000	6.829	—	-9.116	38.822	
31	-4.879	88.278	—	-8.157	—	817.044
32	—	-5.541	2.757	76.299	—	-700.117

S7 файл о7s5B

1	$16 \cdot Y_E + 11 \cdot S - 343.5 = 0; \quad 12 \cdot Y_E + 7 \cdot S - 203.1 = 0.$
2	$16 \cdot Y_E + 14 \cdot S - 497.42 = 0; \quad 9 \cdot Y_E + 7 \cdot S - 203.41 = 0.$
3	$3.46 \cdot X_E + 5 \cdot Y_E - 5.84 = 0; \quad -1.73 \cdot X_E + 16 \cdot Y_E - 212.08 = 0.$
4	$6 \cdot X_A + 6 \cdot Y_A - 33 = 0; \quad 2.54 \cdot X_A - 10 \cdot Y_A + 370.37 = 0.$
5	$-3.46 \cdot X_E - 3 \cdot Y_E - 13.62 = 0; \quad 0 \cdot X_E + 11 \cdot Y_E - 202.64 = 0.$
6	$-8 \cdot Y_E = 20.78 - 109.5; \quad M_A = 519.57 - 16 \cdot Y_E;$
7	$6 \cdot X_E + 3 \cdot Y_E + 13.5 = 0; \quad 0.8 \cdot X_E + 16 \cdot Y_E - 240.53 = 0.$
8	$-3.46 \cdot X_A - 6 \cdot Y_A + 32.12 = 0; \quad 0 \cdot X_A - 16 \cdot Y_A + 107.89 = 0.$
9	$Y_A = 11.12/(-2); \quad M_E = -809.28 + Y_A(11)$
10	$-5 \cdot Y_E = 24 - 37.5; \quad M_A = 638.9 - 16 \cdot Y_E;$
11	$2 \cdot Y_E = -12.12 - 12; \quad M_A = 626.07 - 12 \cdot Y_E;$
12	$Y_A = 132.88/(8); \quad M_E = -459.53 + Y_A(16)$
13	$-3.46 \cdot X_E - 4 \cdot Y_E - 4.93 = 0; \quad 1.73 \cdot X_E + 10 \cdot Y_E - 231.14 = 0.$
14	$-3.46 \cdot X_A - 5 \cdot Y_A + 21.43 = 0; \quad 1.73 \cdot X_A - 16 \cdot Y_A + 139.64 = 0.$
15	$-7 \cdot Y_E = -15.59 - 79.5; \quad M_A = 424.37 - 16 \cdot Y_E;$
16	$5.2 \cdot X_E + 8 \cdot Y_E - 23.51 = 0; \quad -0 \cdot X_E + 16 \cdot Y_E - 179.26 = 0.$
17	$5.2 \cdot X_A - 6 \cdot Y_A + 4.31 = 0; \quad 1.73 \cdot X_A - 16 \cdot Y_A + 220.55 = 0.$
18	$Y_A = 20.09/(-3); \quad M_E = -622.44 + Y_A(11)$
19	$Y_A = 14.9/(-3); \quad M_E = -660.82 + Y_A(11)$
20	$-3.46 \cdot X_E - 4 \cdot Y_E - 10.12 = 0; \quad 0.54 \cdot X_E + 10 \cdot Y_E - 198.09 = 0.$
21	$-6 \cdot X_A + 5 \cdot Y_A + 5.5 = 0; \quad -2.54 \cdot X_A - 11 \cdot Y_A + 224.97 = 0.$
22	$16 \cdot Y_E + 11 \cdot S - 405.51 = 0; \quad 10 \cdot Y_E + 5 \cdot S - 162 = 0.$
23	$-3 \cdot Y_E = -21 - 9; \quad 11 \cdot Y_A = 5 \cdot Y_E - 3.46 - 423.07;$
24	$Y_A = 93.36/(7); \quad M_E = -397.82 + Y_A(16)$
25	$-8 \cdot Y_E = 20.78 - 109.5; \quad M_A = 527.57 - 16 \cdot Y_E;$
26	$3.46 \cdot X_A + 4 \cdot Y_A - 10.66 = 0; \quad -2.54 \cdot X_A - 10 \cdot Y_A + 266.58 = 0.$
27	$5.2 \cdot X_E - 2 \cdot Y_E + 1.49 = 0; \quad -0 \cdot X_E + 11 \cdot Y_E - 254.33 = 0.$
28	$5.2 \cdot X_A + 3 \cdot Y_A - 6.59 = 0; \quad -0.8 \cdot X_A - 10 \cdot Y_A + 279.96 = 0.$
29	$3 \cdot Y_E = -13 - 18; \quad 4 \cdot Y_A = 6 \cdot Y_E - 4 - 498.49;$
30	$16 \cdot Y_E + 12 \cdot S - 320.02 = 0; \quad 9 \cdot Y_E + 5 \cdot S - 112.07 = 0.$
31	$2 \cdot Y_E = 18.19 - 34.5; \quad M_A = 727.32 - 11 \cdot Y_E;$
32	$Y_A = 16.62/(-3); \quad M_E = -639.16 + Y_A(11)$