

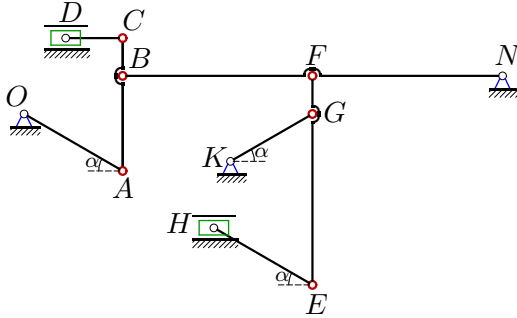
Кинематический анализ механизма (7 звеньев)

Плоский многосвязный механизм с одной степенью свободы приводится в движение кривошипом, который вращается против часовой стрелки с постоянной угловой скоростью. Найти скорости всех шарниров механизма (в см/с) и ускорения трех заданных шарниров (в м/с²). Размеры даны в сантиметрах.

Кирсанов М.Н. **Решебник. Теоретическая механика**/Под ред. А. И. Кириллова. – М.: ФИЗМАТЛИТ, 2008. – 384 с. (с.158.)

Задача К9.1.

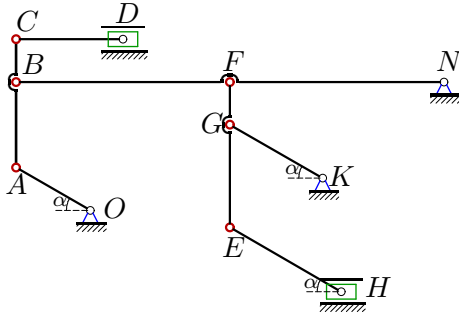
3



$\omega_{NB} = 1$ рад/с, $\alpha = 30^\circ$,
 $AB = 25$, $BC = 10$,
 $BF = 50$, $NF = 50$,
 $CD = 15$, $EH = 30$,
 $FG = 10$, $GE = 45$,
 $OA = 30$, $KG = 25$.
 a_A , a_B , a_C - ?

Задача К9.2.

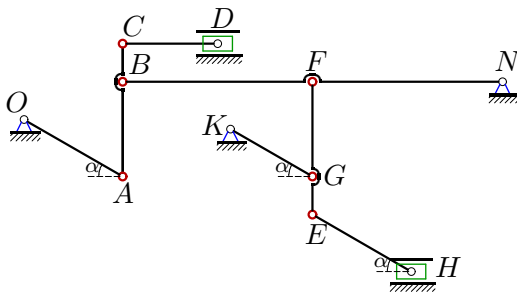
3



$\omega_{NB} = 4$ рад/с, $\alpha = 30^\circ$,
 $AB = 20$, $BC = 10$,
 $BF = 50$, $NF = 50$,
 $CD = 25$, $EH = 30$,
 $FG = 10$, $GE = 24$,
 $OA = 20$, $KG = 25$.
 a_A , a_B , a_C - ?

Задача К9.3.

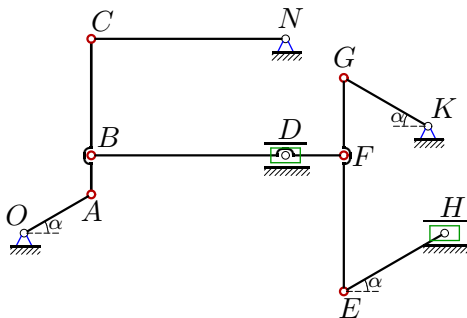
3



$\omega_{OA} = 4$ рад/с, $\alpha = 30^\circ$,
 $AB = 25$, $BC = 10$,
 $BF = 50$, $NF = 50$,
 $CD = 25$, $EH = 30$,
 $FG = 25$, $GE = 10$,
 $OA = 30$, $KG = 25$.
 a_A , a_B , a_C - ?

Задача К9.4.

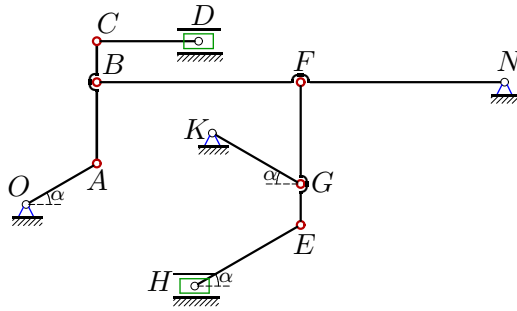
3



$\omega_{NC} = 1$ рад/с, $\alpha = 30^\circ$,
 $AB = 10$, $BC = 30$,
 $DB = 50$, $DF = 15$,
 $NC = 50$, $EH = 30$,
 $FE = 35$, $FG = 20$,
 $OA = 20$, $KG = 25$.
 a_A , a_B , a_C - ?

Задача K9.5.

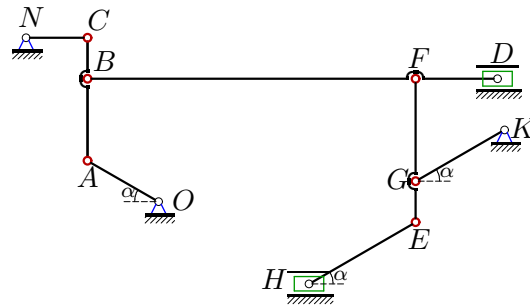
3



$\omega_{OA} = 4$ рад/с, $\alpha = 30^\circ$,
 $AB = 20$, $BC = 10$,
 $BF = 50$, $NF = 50$,
 $CD = 25$, $EH = 30$,
 $FG = 25$, $GE = 10$,
 $OA = 20$, $KG = 25$.
 a_A , a_B , a_C - ?

Задача K9.6.

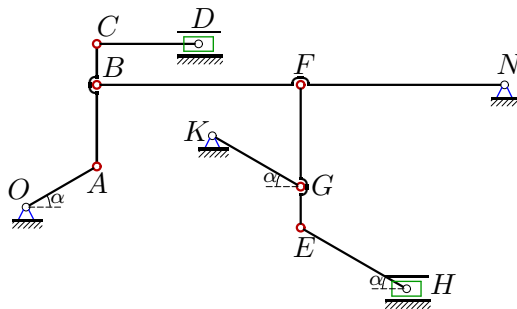
3



$\omega_{OA} = 3$ рад/с, $\alpha = 30^\circ$,
 $AB = 20$, $BC = 10$,
 $BF = 80$, $FD = 20$,
 $NC = 15$, $EH = 30$,
 $FE = 35$, $FG = 25$,
 $OA = 20$, $KG = 25$.
 a_A , a_B , a_C - ?

Задача K9.7.

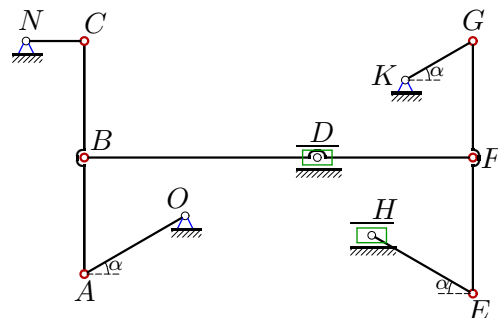
3



$\omega_{OA} = 1$ рад/с, $\alpha = 30^\circ$,
 $AB = 20$, $BC = 10$,
 $BF = 50$, $NF = 50$,
 $CD = 25$, $EH = 30$,
 $FG = 25$, $GE = 10$,
 $OA = 20$, $KG = 25$.
 a_A , a_B , a_C - ?

Задача K9.8.

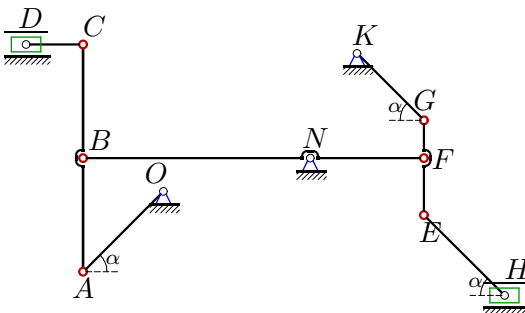
3



$\omega_{NC} = 2$ рад/с, $\alpha = 30^\circ$,
 $AB = 30$, $BC = 30$,
 $DB = 60$, $DF = 40$,
 $NC = 15$, $EH = 30$,
 $FE = 35$, $FG = 30$,
 $OA = 30$, $KG = 20$.
 a_A , a_B , a_C - ?

Задача K9.9.

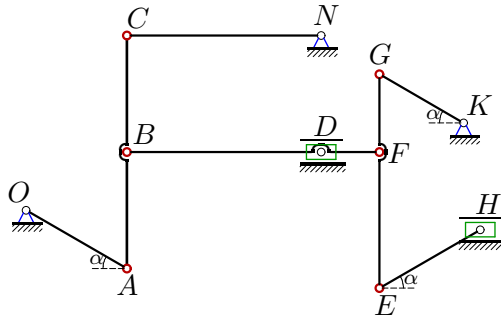
3



$\omega_{KG} = 2$ рад/с, $\alpha = 45^\circ$,
 $AB = 30$, $BC = 30$,
 $NB = 60$, $NF = 30$,
 $CD = 15$, $EH = 30$,
 $FE = 15$, $FG = 10$,
 $OA = 30$, $KG = 25$.
 a_G , a_F , a_E - ?

Задача K9.10.

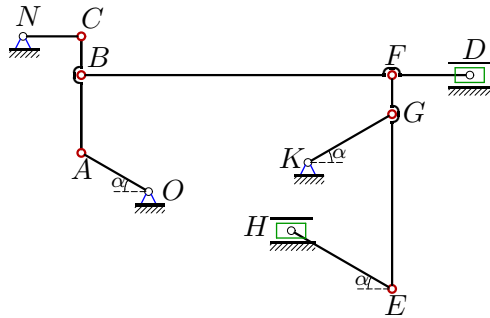
3



$\omega_{OA} = 3 \text{ рад/с}, \alpha = 30^\circ,$
 $AB = 30, BC = 30,$
 $DB = 50, DF = 15,$
 $NC = 50, EH = 30,$
 $FE = 35, FG = 20,$
 $OA = 30, KG = 25.$
 $a_A, a_B, a_C - ?$

Задача K9.11.

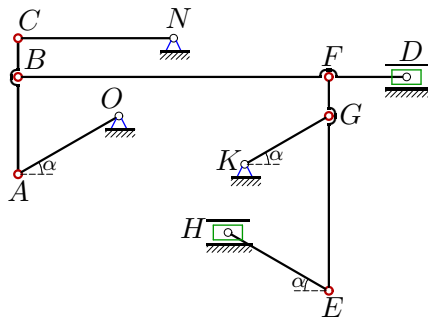
3



$\omega_{OA} = 3 \text{ рад/с}, \alpha = 30^\circ,$
 $AB = 20, BC = 10,$
 $BF = 80, FD = 20,$
 $NC = 15, EH = 30,$
 $FE = 55, FG = 10,$
 $OA = 20, KG = 25.$
 $a_A, a_B, a_C - ?$

Задача K9.12.

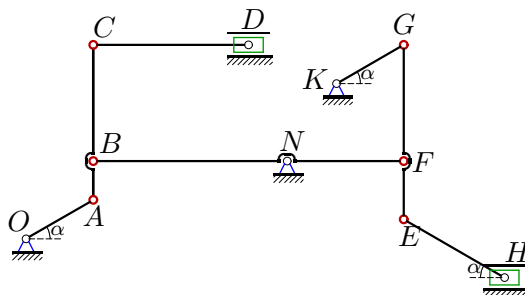
3



$\omega_{NC} = 3 \text{ рад/с}, \alpha = 30^\circ,$
 $AB = 25, BC = 10,$
 $BF = 80, FD = 20,$
 $NC = 40, EH = 30,$
 $FE = 55, FG = 10,$
 $OA = 30, KG = 25.$
 $a_A, a_B, a_C - ?$

Задача K9.13.

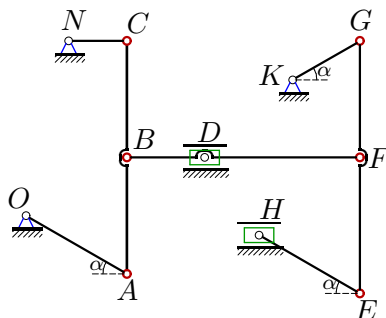
3



$\omega_{BF} = 2 \text{ рад/с}, \alpha = 30^\circ,$
 $AB = 10, BC = 30,$
 $NB = 50, NF = 30,$
 $CD = 40, EH = 30,$
 $FE = 15, FG = 30,$
 $OA = 20, KG = 20.$
 $a_A, a_B, a_C - ?$

Задача K9.14.

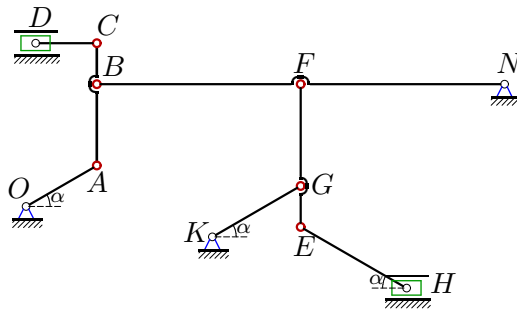
3



$\omega_{OA} = 1 \text{ рад/с}, \alpha = 30^\circ,$
 $AB = 30, BC = 30,$
 $DB = 20, DF = 40,$
 $NC = 15, EH = 30,$
 $FE = 35, FG = 30,$
 $OA = 30, KG = 20.$
 $a_A, a_B, a_C - ?$

Задача K9.15.

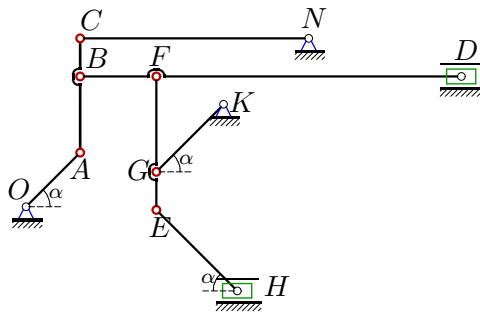
3



$\omega_{KG} = 3 \text{ рад/с}, \alpha = 30^\circ,$
 $AB = 20, BC = 10,$
 $BF = 50, NF = 50,$
 $CD = 15, EH = 30,$
 $FG = 25, GE = 10,$
 $OA = 20, KG = 25.$
 $a_G, a_F, a_E - ?$

Задача K9.16.

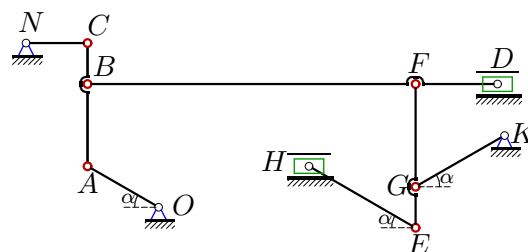
3



$\omega_{OA} = 2 \text{ рад/с}, \alpha = 45^\circ,$
 $AB = 20, BC = 10,$
 $BF = 20, FD = 80,$
 $NC = 60, EH = 30,$
 $FE = 35, FG = 25,$
 $OA = 20, KG = 25.$
 $a_A, a_B, a_C - ?$

Задача K9.17.

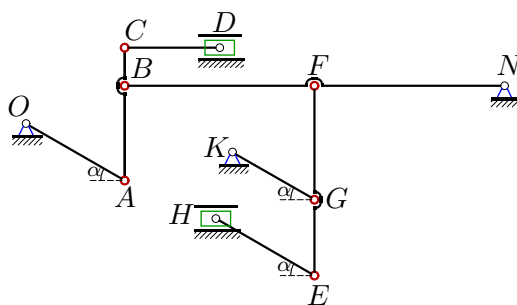
3



$\omega_{NC} = 4 \text{ рад/с}, \alpha = 30^\circ,$
 $AB = 20, BC = 10,$
 $BF = 80, FD = 20,$
 $NC = 15, EH = 30,$
 $FE = 35, FG = 25,$
 $OA = 20, KG = 25.$
 $a_A, a_B, a_C - ?$

Задача K9.18.

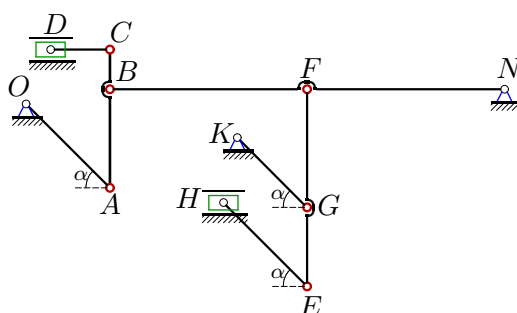
3



$\omega_{KG} = 4 \text{ рад/с}, \alpha = 30^\circ,$
 $AB = 25, BC = 10,$
 $BF = 50, NF = 50,$
 $CD = 25, EH = 30,$
 $FG = 30, GE = 20,$
 $OA = 30, KG = 25.$
 $a_G, a_F, a_E - ?$

Задача K9.19.

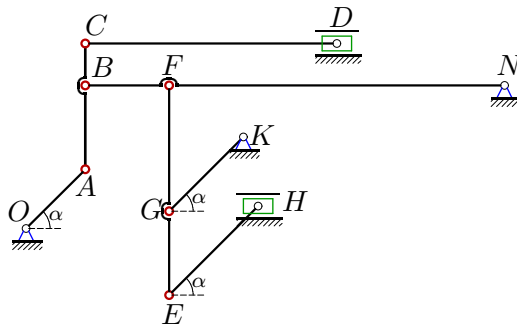
3



$\omega_{KG} = 2 \text{ рад/с}, \alpha = 45^\circ,$
 $AB = 25, BC = 10,$
 $BF = 50, NF = 50,$
 $CD = 15, EH = 30,$
 $FG = 30, GE = 20,$
 $OA = 30, KG = 25.$
 $a_G, a_F, a_E - ?$

Задача K9.20.

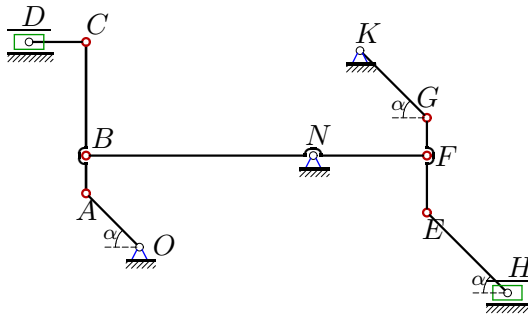
3



$\omega_{OA} = 3 \text{ рад/с}, \alpha = 45^\circ,$
 $AB = 20, BC = 10,$
 $BF = 20, NF = 80,$
 $CD = 60, EH = 30,$
 $FG = 30, GE = 20,$
 $OA = 20, KG = 25.$
 $a_A, a_B, a_C - ?$

Задача K9.21.

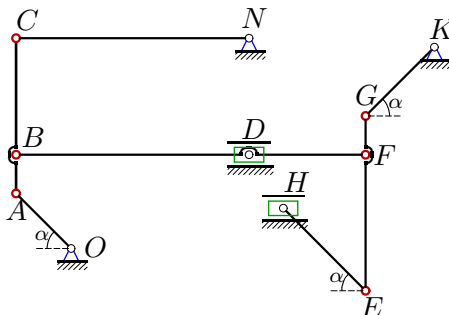
3



$\omega_{KG} = 2 \text{ рад/с}, \alpha = 45^\circ,$
 $AB = 10, BC = 30,$
 $NB = 60, NF = 30,$
 $CD = 15, EH = 30,$
 $FE = 15, FG = 10,$
 $OA = 20, KG = 25.$
 $a_G, a_F, a_E - ?$

Задача K9.22.

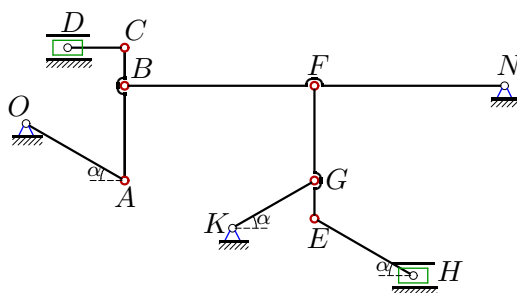
3



$\omega_{NC} = 3 \text{ рад/с}, \alpha = 45^\circ,$
 $AB = 10, BC = 30,$
 $DB = 60, DF = 30,$
 $NC = 60, EH = 30,$
 $FE = 35, FG = 10,$
 $OA = 20, KG = 25.$
 $a_A, a_B, a_C - ?$

Задача K9.23.

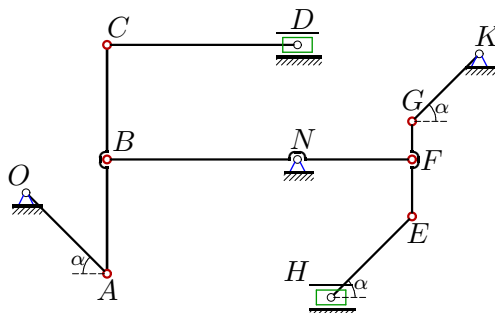
3



$\omega_{KG} = 1 \text{ рад/с}, \alpha = 30^\circ,$
 $AB = 25, BC = 10,$
 $BF = 50, NF = 50,$
 $CD = 15, EH = 30,$
 $FG = 25, GE = 10,$
 $OA = 30, KG = 25.$
 $a_G, a_F, a_E - ?$

Задача K9.24.

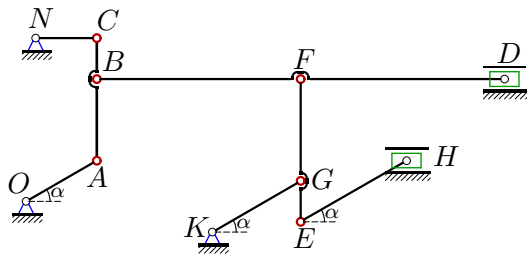
3



$\omega_{OA} = 4 \text{ рад/с}, \alpha = 45^\circ,$
 $AB = 30, BC = 30,$
 $NB = 50, NF = 30,$
 $CD = 50, EH = 30,$
 $FE = 15, FG = 10,$
 $OA = 30, KG = 25.$
 $a_A, a_B, a_C - ?$

Задача K9.25.

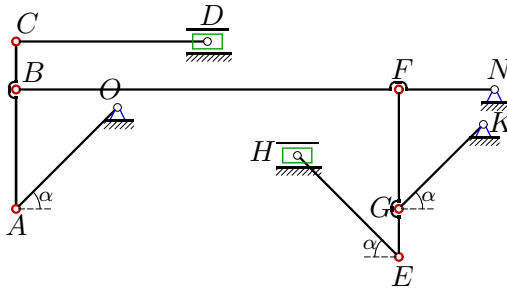
3



$\omega_{OA} = 3$ рад/с, $\alpha = 30^\circ$,
 $AB = 20$, $BC = 10$,
 $BF = 50$, $FD = 50$,
 $NC = 15$, $EH = 30$,
 $FE = 35$, $FG = 25$,
 $OA = 20$, $KG = 25$.
 a_A , a_B , a_C - ?

Задача K9.26.

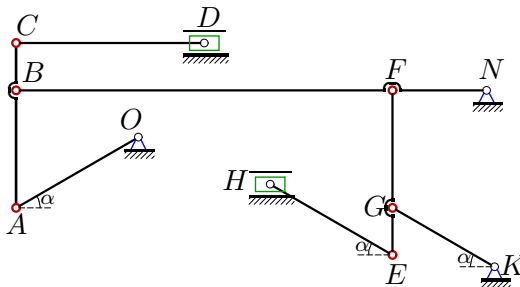
3



$\omega_{KG} = 3$ рад/с, $\alpha = 45^\circ$,
 $AB = 25$, $BC = 10$,
 $BF = 80$, $NF = 20$,
 $CD = 40$, $EH = 30$,
 $FG = 25$, $GE = 10$,
 $OA = 30$, $KG = 25$.
 a_G , a_F , a_E - ?

Задача K9.27.

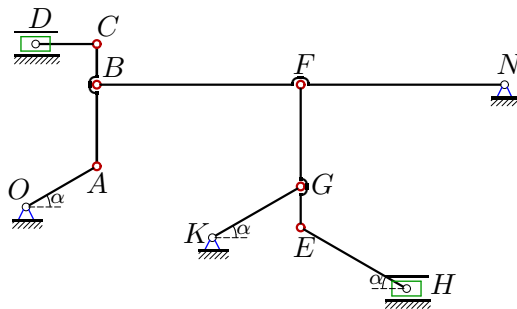
3



$\omega_{OA} = 2$ рад/с, $\alpha = 30^\circ$,
 $AB = 25$, $BC = 10$,
 $BF = 80$, $NF = 20$,
 $CD = 40$, $EH = 30$,
 $FG = 25$, $GE = 10$,
 $OA = 30$, $KG = 25$.
 a_A , a_B , a_C - ?

Задача K9.28.

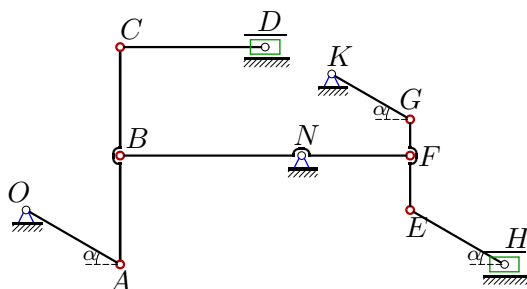
3



$\omega_{OA} = 3$ рад/с, $\alpha = 30^\circ$,
 $AB = 20$, $BC = 10$,
 $BF = 50$, $NF = 50$,
 $CD = 15$, $EH = 30$,
 $FG = 25$, $GE = 10$,
 $OA = 20$, $KG = 25$.
 a_A , a_B , a_C - ?

Задача K9.29.

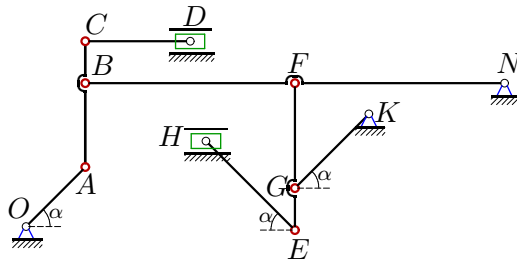
3



$\omega_{KG} = 4$ рад/с, $\alpha = 30^\circ$,
 $AB = 30$, $BC = 30$,
 $NB = 50$, $NF = 30$,
 $CD = 40$, $EH = 30$,
 $FE = 15$, $FG = 10$,
 $OA = 30$, $KG = 25$.
 a_G , a_F , a_E - ?

Задача К9.30.

3



$\omega_{KG} = 2 \text{ рад/с}, \alpha = 45^\circ,$
 $AB = 20, BC = 10,$
 $BF = 50, NF = 50,$
 $CD = 25, EH = 30,$
 $FG = 25, GE = 10,$
 $OA = 20, KG = 25.$
 $a_G, a_F, a_E - ?$

К9 Ответы.
Кинематический анализ механизма (7 звеньев)

04.04.2012

№	v_A	v_B	v_C	v_D	v_E	v_F	v_G	v_H
1	115.470	100.000	102.632	23.094	166.458	50.000	57.735	187.639
2	461.880	400.000	416.333	115.470	440.606	200.000	230.940	277.128
3	120.000	103.923	106.658	24.000	66.813	51.962	60.000	12.000
4	57.735	54.486	50.000	21.651	46.850	26.339	17.321	53.044
5	80.000	69.282	72.111	20.000	44.542	34.641	40.000	48.000
6	60.000	52.915	51.962	10.000	16.179	14.422	12.000	6.400
7	20.000	17.321	18.028	5.000	11.136	8.660	10.000	2.000
8	34.641	31.225	30.000	8.660	37.936	21.794	23.094	20.688
9	100.000	70.711	100.000	70.711	63.738	35.355	50.000	88.388
10	90.000	81.125	77.942	22.500	88.640	32.450	27.000	72.000
11	60.000	52.915	51.962	10.000	78.689	14.422	12.000	84.000
12	138.564	121.622	120.000	19.795	27.231	31.110	27.713	0.990
13	115.470	100.000	200.000	173.205	62.450	60.000	69.282	17.321
14	30.000	27.042	25.981	7.500	55.241	52.500	60.000	11.250
15	150.000	129.904	135.208	37.500	83.516	64.952	75.000	90.000
16	40.000	29.814	28.284	9.428	35.928	24.513	32.000	50.535
17	69.282	61.101	60.000	11.547	18.682	16.653	13.856	21.246
18	200.000	173.205	177.764	40.000	120.185	86.603	100.000	33.333
19	100.000	70.711	76.158	28.284	68.718	35.355	50.000	23.570
20	60.000	42.426	47.434	21.213	65.970	33.941	48.000	22.627
21	100.000	70.711	223.607	212.132	63.738	35.355	50.000	88.388
22	254.558	225.000	180.000	135.000	306.033	162.250	127.279	382.500
23	50.000	43.301	44.441	10.000	27.839	21.651	25.000	30.000
24	120.000	84.853	120.000	84.853	91.782	50.912	72.000	127.279
25	60.000	52.915	51.962	10.000	31.048	27.839	30.000	2.000
26	375.000	265.165	285.591	106.066	91.241	53.033	75.000	127.279
27	60.000	51.962	53.329	12.000	13.363	10.392	12.000	2.400
28	60.000	51.962	54.083	15.000	33.407	25.981	30.000	36.000
29	166.667	144.338	166.667	83.333	114.564	86.603	100.000	125.000
30	100.000	70.711	79.057	35.355	60.828	35.355	50.000	84.853

№	ω_{OA}	ω_{CA}	ω_{CD}	ω_{BF}	ω_{FE}	ω_{KG}	ω_{EH}	ω_{NC}	a_A	a_B	a_C	a_E	a_F	a_G
1	-3.849	-2.309	-6.667	1.000	2.887	-2.309	-1.925	-	4.561	1.000	3.190	-	-	-
2	23.094	-11.547	16.000	4.000	-11.547	9.238	7.698	-	141.107	16.000	47.204	-	-	-
3	4.000	2.400	-4.157	-1.039	1.200	2.400	-2.000	-	4.800	1.445	3.198	-	-	-
4	-2.887	0.722	-	1.000	0.650	-0.693	-0.577	1.000	2.055	1.417	0.500	-	-	-
5	4.000	-2.000	-2.771	-0.693	0.800	1.600	1.333	-	3.200	2.448	3.503	-	-	-
6	3.000	-1.000	-	0.520	0.640	0.480	-0.400	-3.464	1.800	1.293	2.163	-	-	-
7	1.000	-0.500	-0.693	-0.173	0.200	0.400	-0.333	-	0.200	0.153	0.219	-	-	-
8	-1.155	-0.289	-	-0.500	-0.674	-1.155	-0.770	2.000	0.436	0.087	0.600	-	-	-
9	3.333	2.357	-4.714	1.179	-3.536	2.000	-1.667	-	-	-	-	3.832	2.001	1.000
10	3.000	0.750	-	-1.559	1.800	1.080	0.900	-1.559	2.700	1.308	1.582	-	-	-
11	3.000	-1.000	-	0.520	1.600	-0.480	-0.400	-3.464	1.800	1.293	2.163	-	-	-
12	4.619	1.979	-	1.200	-0.594	-1.109	-0.924	3.000	6.739	4.474	3.600	-	-	-
13	-5.774	5.774	2.500	2.000	1.155	3.464	-2.309	-	10.184	2.000	38.200	-	-	-
14	1.000	0.250	-	-1.299	-0.750	-3.000	-2.000	1.732	0.300	0.378	0.464	-	-	-
15	7.500	-3.750	8.660	-1.299	-1.500	3.000	-2.500	-	-	-	-	3.195	1.887	2.250
16	2.000	-0.943	-	-0.283	-0.528	-1.280	-1.067	-0.471	0.800	0.750	0.843	-	-	-
17	-3.464	1.155	-	-0.600	-0.739	-0.554	0.462	4.000	3.029	0.614	2.400	-	-	-
18	6.667	4.000	-6.928	-1.732	1.667	4.000	3.333	-	-	-	-	7.240	1.900	4.000
19	3.333	2.828	4.714	-0.707	1.179	2.000	1.667	-	-	-	-	1.667	0.383	1.000
20	3.000	-2.121	-0.707	-0.424	-1.131	-1.920	-1.600	-	1.800	2.180	2.775	-	-	-
21	5.000	-7.071	-4.714	1.179	-3.536	2.000	-1.667	-	-	-	-	3.832	2.001	1.000
22	12.728	-4.500	-	3.000	-4.500	-5.091	4.243	3.000	54.526	42.230	5.400	-	-	-
23	1.667	1.000	2.887	-0.433	-0.500	1.000	-0.833	-	-	-	-	0.355	0.210	0.250
24	4.000	2.828	-1.697	-1.697	-5.091	2.880	-2.400	-	4.800	1.750	6.430	-	-	-
25	3.000	-1.000	-	-0.520	-0.200	1.200	-1.000	3.464	1.800	2.041	2.163	-	-	-
26	12.500	10.607	6.629	2.652	2.121	3.000	-2.500	-	-	-	-	2.634	1.481	2.250
27	2.000	1.200	1.299	0.520	-0.240	0.480	-0.400	-	1.200	0.361	0.103	-	-	-
28	3.000	-1.500	3.464	-0.520	-0.600	1.200	-1.000	-	1.800	1.377	1.971	-	-	-
29	-5.556	-2.778	3.608	2.887	-5.000	4.000	-3.333	-	-	-	-	8.317	5.148	4.000
30	-5.000	3.536	2.828	0.707	1.414	2.000	-1.667	-	-	-	-	1.271	0.325	1.000