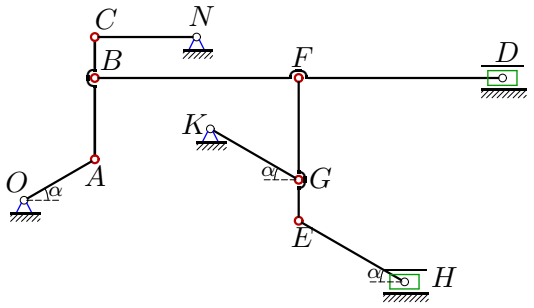
Кинематический анализ механизма (7 звеньев)

Плоский многозвенный 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/$с^2$). Размеры даны в сантиметрах.

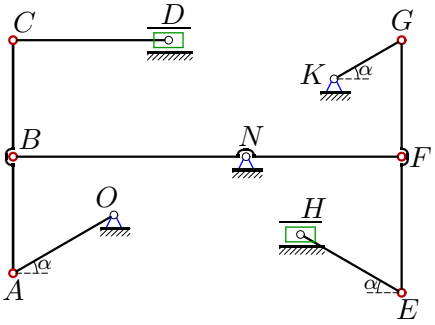
Кирсанов М.Н. **Решебник. Теоретическая механика**/Под ред. А. И. Кириллова.– М.: ФИЗМАТЛИТ, 2008. — 384 с. (с.158.)

Задача К9.1. 6



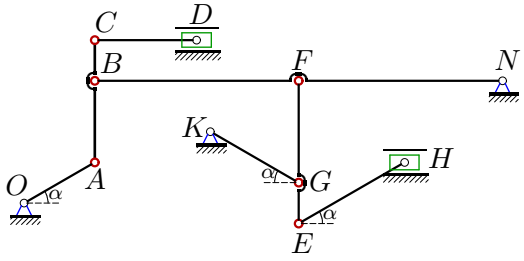
$\omega_{OA} = 3$ рад/с, $\alpha = 30°$,
$AB = 20$, $BC = 10$,
$BF = 50$, $FD = 50$,
$NC = 25$, $EH = 30$,
$FE = 35$, $FG = 25$,
$OA = 20$, $KG = 25$.
a_A, a_B, a_C– ?

Задача К9.2. 6



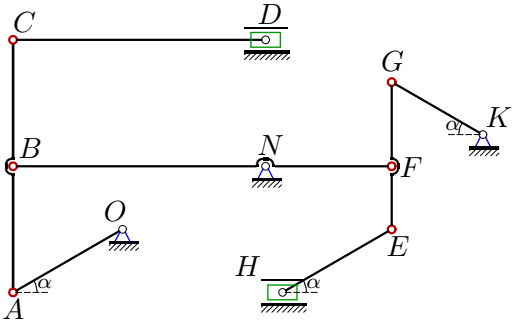
$\omega_{OA} = 3$ рад/с, $\alpha = 30°$,
$AB = 30$, $BC = 30$,
$NB = 60$, $NF = 40$,
$CD = 40$, $EH = 30$,
$FE = 35$, $FG = 30$,
$OA = 30$, $KG = 20$.
a_A, a_B, a_C– ?

Задача К9.3. 6



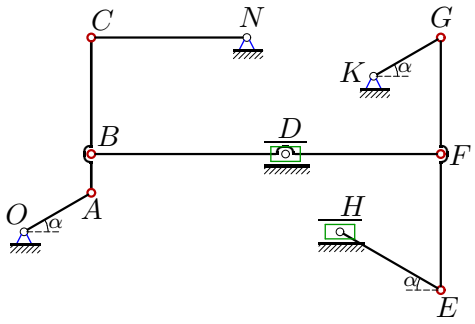
$\omega_{OA} = 4$ рад/с, $\alpha = 30°$,
$AB = 20$, $BC = 10$,
$BF = 50$, $NF = 50$,
$CD = 25$, $EH = 30$,
$FG = 25$, $GE = 10$,
$OA = 20$, $KG = 25$.
a_A, a_B, a_C– ?

Задача К9.4. 6



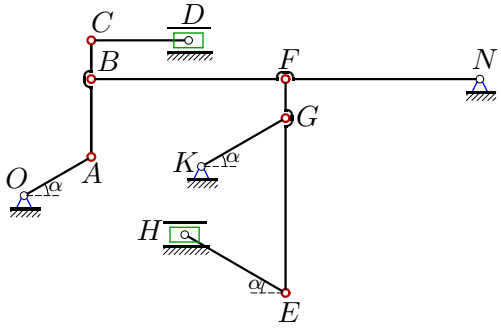
$\omega_{OA} = 1$ рад/с, $\alpha = 30°$,
$AB = 30$, $BC = 30$,
$NB = 60$, $NF = 30$,
$CD = 60$, $EH = 30$,
$FE = 15$, $FG = 20$,
$OA = 30$, $KG = 25$.
a_A, a_B, a_C– ?

Задача К9.5. 6



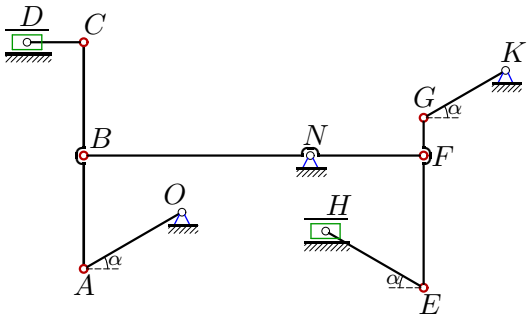
$\omega_{NC} = 4$ рад/с, $\alpha = 30°$,
$AB = 10$, $BC = 30$,
$DB = 50$, $DF = 40$,
$NC = 40$, $EH = 30$,
$FE = 35$, $FG = 30$,
$OA = 20$, $KG = 20$.
a_A, a_B, a_C – ?

Задача К9.6. 6



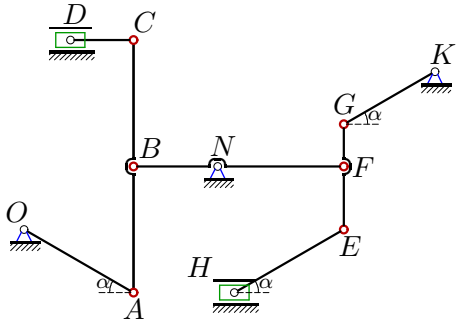
$\omega_{NB} = 1$ рад/с, $\alpha = 30°$,
$AB = 20$, $BC = 10$,
$BF = 50$, $NF = 50$,
$CD = 25$, $EH = 30$,
$FG = 10$, $GE = 45$,
$OA = 20$, $KG = 25$.
a_A, a_B, a_C – ?

Задача К9.7. 6



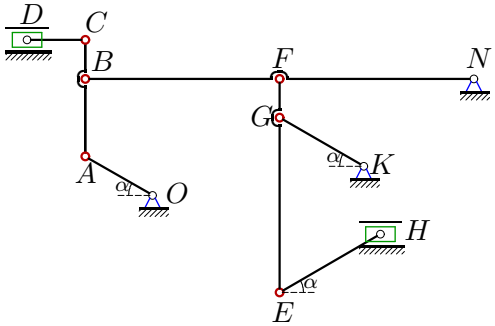
$\omega_{KG} = 1$ рад/с, $\alpha = 30°$,
$AB = 30$, $BC = 30$,
$NB = 60$, $NF = 30$,
$CD = 15$, $EH = 30$,
$FE = 35$, $FG = 10$,
$OA = 30$, $KG = 25$.
a_G, a_F, a_E – ?

Задача К9.8. 6



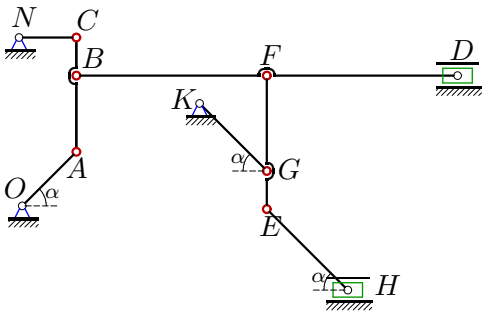
$\omega_{KG} = 1$ рад/с, $\alpha = 30°$,
$AB = 30$, $BC = 30$,
$NB = 20$, $NF = 30$,
$CD = 15$, $EH = 30$,
$FE = 15$, $FG = 10$,
$OA = 30$, $KG = 25$.
a_G, a_F, a_E – ?

Задача К9.9. 6



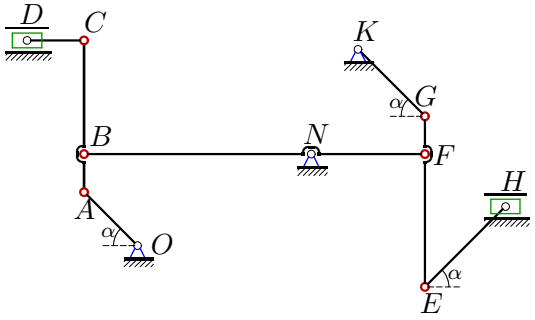
$\omega_{KG} = 2$ рад/с, $\alpha = 30°$,
$AB = 20$, $BC = 10$,
$BF = 50$, $NF = 50$,
$CD = 15$, $EH = 30$,
$FG = 10$, $GE = 45$,
$OA = 20$, $KG = 25$.
a_G, a_F, a_E – ?

Задача К9.10. 6



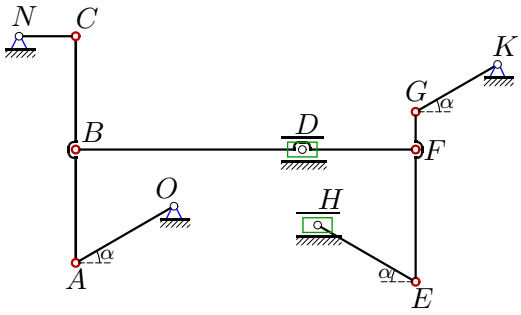
$\omega_{NC} = 1$ рад/с, $\alpha = 45°$,
$AB = 20$, $BC = 10$,
$BF = 50$, $FD = 50$,
$NC = 15$, $EH = 30$,
$FE = 35$, $FG = 25$,
$OA = 20$, $KG = 25$.
a_A, a_B, a_C – ?

Задача К9.11. 6



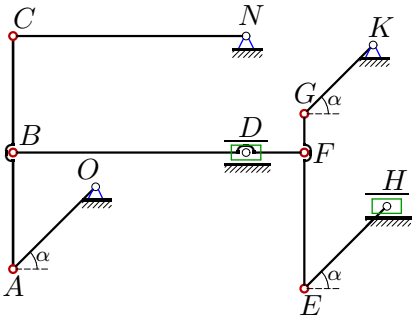
$\omega_{BF} = 1$ рад/с, $\alpha = 45°$,
$AB = 10$, $BC = 30$,
$NB = 60$, $NF = 30$,
$CD = 15$, $EH = 30$,
$FE = 35$, $FG = 10$,
$OA = 20$, $KG = 25$.
a_A, a_B, a_C – ?

Задача К9.12. 6



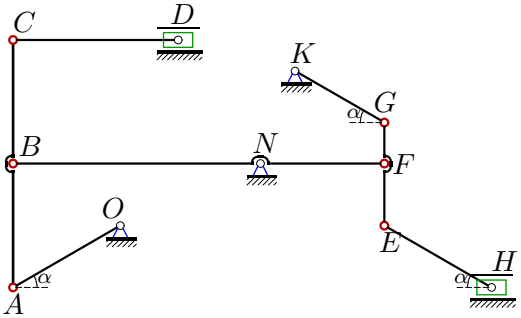
$\omega_{OA} = 2$ рад/с, $\alpha = 30°$,
$AB = 30$, $BC = 30$,
$DB = 60$, $DF = 30$,
$NC = 15$, $EH = 30$,
$FE = 35$, $FG = 10$,
$OA = 30$, $KG = 25$.
a_A, a_B, a_C – ?

Задача К9.13. 6



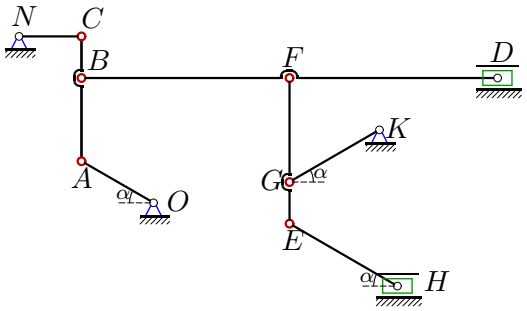
$\omega_{OA} = 1$ рад/с, $\alpha = 45°$,
$AB = 30$, $BC = 30$,
$DB = 60$, $DF = 15$,
$NC = 60$, $EH = 30$,
$FE = 35$, $FG = 10$,
$OA = 30$, $KG = 25$.
a_A, a_B, a_C – ?

Задача К9.14. 6



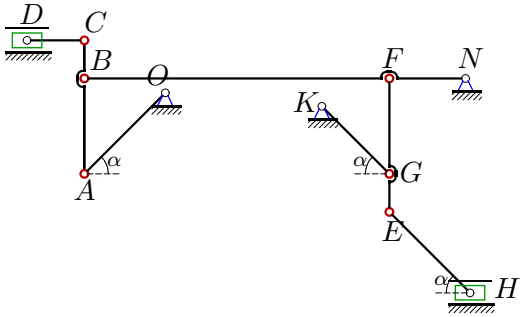
$\omega_{KG} = 2$ рад/с, $\alpha = 30°$,
$AB = 30$, $BC = 30$,
$NB = 60$, $NF = 30$,
$CD = 40$, $EH = 30$,
$FE = 15$, $FG = 10$,
$OA = 30$, $KG = 25$.
a_G, a_F, a_E – ?

Задача К9.15. 6



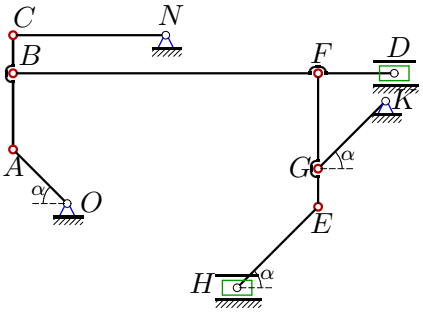
$\omega_{OA} = 2$ рад/с, $\alpha = 30°$,
$AB = 20$, $BC = 10$,
$BF = 50$, $FD = 50$,
$NC = 15$, $EH = 30$,
$FE = 35$, $FG = 25$,
$OA = 20$, $KG = 25$.
a_A, a_B, a_C – ?

Задача К9.16. 6



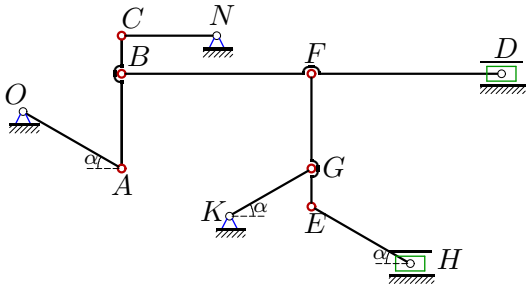
$\omega_{OA} = 1$ рад/с, $\alpha = 45°$,
$AB = 25$, $BC = 10$,
$BF = 80$, $NF = 20$,
$CD = 15$, $EH = 30$,
$FG = 25$, $GE = 10$,
$OA = 30$, $KG = 25$.
a_A, a_B, a_C – ?

Задача К9.17. 6



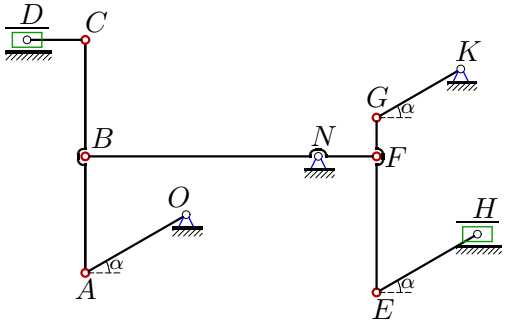
$\omega_{NC} = 1$ рад/с, $\alpha = 45°$,
$AB = 20$, $BC = 10$,
$BF = 80$, $FD = 20$,
$NC = 40$, $EH = 30$,
$FE = 35$, $FG = 25$,
$OA = 20$, $KG = 25$.
a_A, a_B, a_C – ?

Задача К9.18. 6



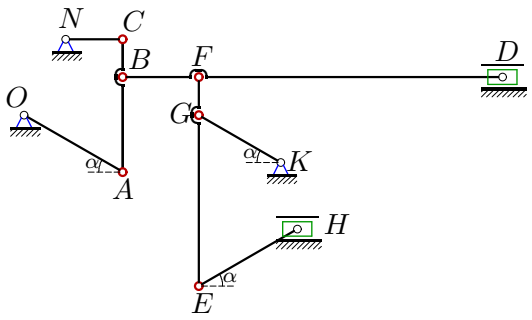
$\omega_{NC} = 1$ рад/с, $\alpha = 30°$,
$AB = 25$, $BC = 10$,
$BF = 50$, $FD = 50$,
$NC = 25$, $EH = 30$,
$FE = 35$, $FG = 25$,
$OA = 30$, $KG = 25$.
a_A, a_B, a_C – ?

Задача К9.19. 6



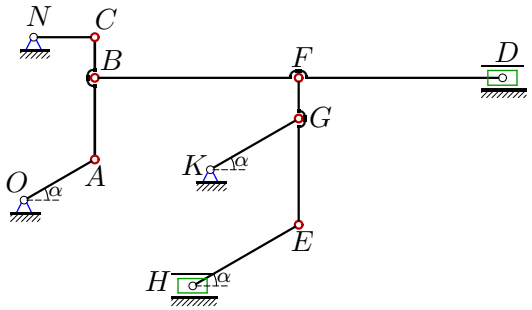
$\omega_{KG} = 3$ рад/с, $\alpha = 30°$,
$AB = 30$, $BC = 30$,
$NB = 60$, $NF = 15$,
$CD = 15$, $EH = 30$,
$FE = 35$, $FG = 10$,
$OA = 30$, $KG = 25$.
a_G, a_F, a_E – ?

Задача К9.20. 6



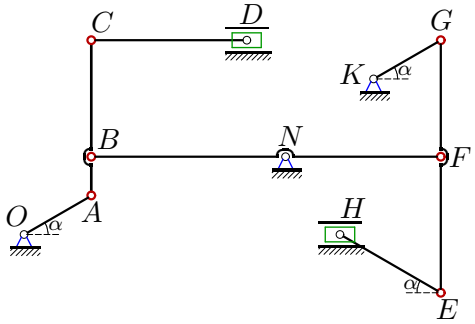
$\omega_{NC} = 3$ рад/с, $\alpha = 30°$,
$AB = 25$, $BC = 10$,
$BF = 20$, $FD = 80$,
$NC = 15$, $EH = 30$,
$FE = 55$, $FG = 10$,
$OA = 30$, $KG = 25$.
a_A, a_B, a_C – ?

Задача К9.21. 6



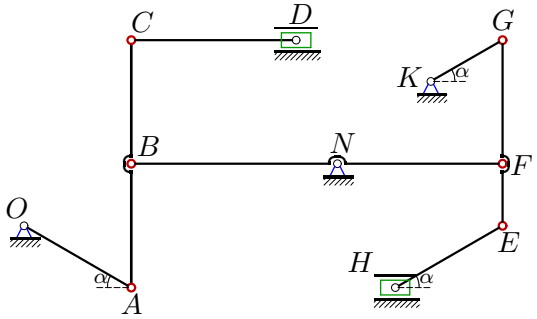
$\omega_{NC} = 1$ рад/с, $\alpha = 30°$,
$AB = 20$, $BC = 10$,
$BF = 50$, $FD = 50$,
$NC = 15$, $EH = 30$,
$FE = 36$, $FG = 10$,
$OA = 20$, $KG = 25$.
a_A, a_B, a_C – ?

Задача К9.22. 6



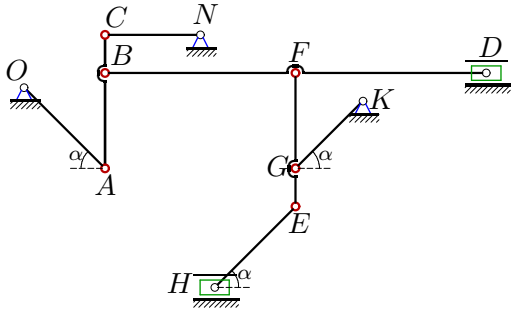
$\omega_{BF} = 1$ рад/с, $\alpha = 30°$,
$AB = 10$, $BC = 30$,
$NB = 50$, $NF = 40$,
$CD = 40$, $EH = 30$,
$FE = 35$, $FG = 30$,
$OA = 20$, $KG = 20$.
a_A, a_B, a_C – ?

Задача К9.23. 6



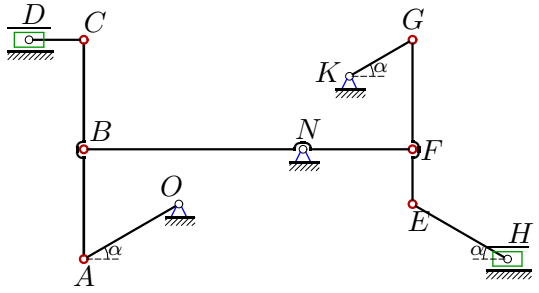
$\omega_{KG} = 3$ рад/с, $\alpha = 30°$,
$AB = 30$, $BC = 30$,
$NB = 50$, $NF = 40$,
$CD = 40$, $EH = 30$,
$FE = 15$, $FG = 30$,
$OA = 30$, $KG = 20$.
a_G, a_F, a_E – ?

Задача К9.24. 6



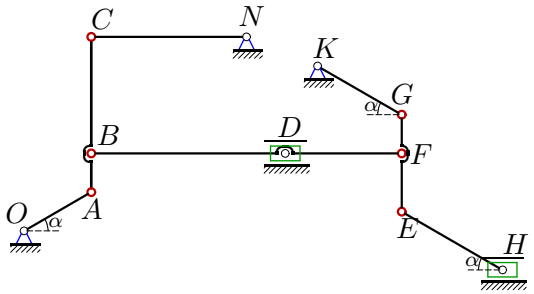
$\omega_{OA} = 1$ рад/с, $\alpha = 45°$,
$AB = 25$, $BC = 10$,
$BF = 50$, $FD = 50$,
$NC = 25$, $EH = 30$,
$FE = 35$, $FG = 25$,
$OA = 30$, $KG = 25$.
a_A, a_B, a_C – ?

Задача К9.25. 6



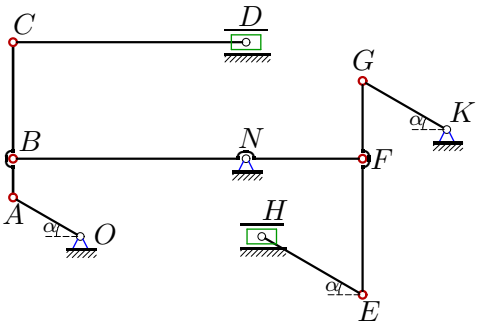
$\omega_{OA} = 2$ рад/с, $\alpha = 30°$,
$AB = 30$, $BC = 30$,
$NB = 60$, $NF = 30$,
$CD = 15$, $EH = 30$,
$FE = 15$, $FG = 30$,
$OA = 30$, $KG = 20$.
a_A, a_B, a_C – ?

Задача К9.26. 6



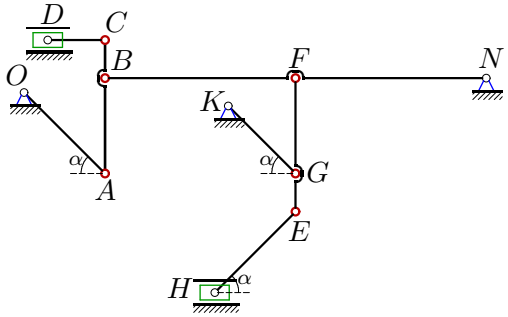
$\omega_{OA} = 4$ рад/с, $\alpha = 30°$,
$AB = 10$, $BC = 30$,
$DB = 50$, $DF = 30$,
$NC = 40$, $EH = 30$,
$FE = 15$, $FG = 10$,
$OA = 20$, $KG = 25$.
a_A, a_B, a_C – ?

Задача К9.27. 6



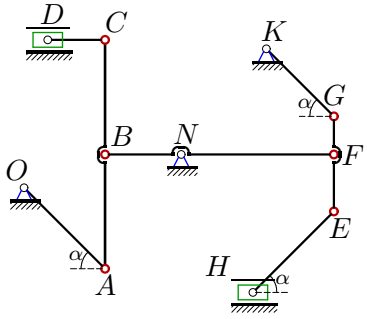
$\omega_{KG} = 4$ рад/с, $\alpha = 30°$,
$AB = 10$, $BC = 30$,
$NB = 60$, $NF = 30$,
$CD = 60$, $EH = 30$,
$FE = 35$, $FG = 20$,
$OA = 20$, $KG = 25$.
a_G, a_F, a_E – ?

Задача К9.28. 6



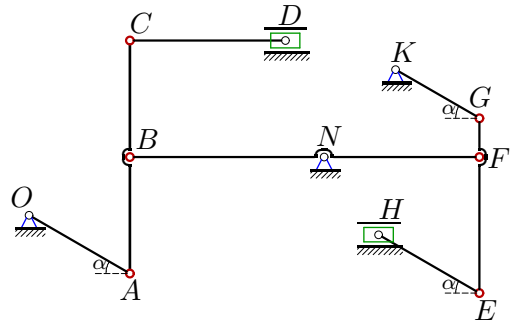
$\omega_{NB} = 1$ рад/с, $\alpha = 45°$,
$AB = 25$, $BC = 10$,
$BF = 50$, $NF = 50$,
$CD = 15$, $EH = 30$,
$FG = 25$, $GE = 10$,
$OA = 30$, $KG = 25$.
a_A, a_B, a_C – ?

Задача К9.29. 6



$\omega_{BF} = 3$ рад/с, $\alpha = 45°$,
$AB = 30$, $BC = 30$,
$NB = 20$, $NF = 40$,
$CD = 15$, $EH = 30$,
$FE = 15$, $FG = 10$,
$OA = 30$, $KG = 25$.
a_A, a_B, a_C – ?

Задача К9.30.



$\omega_{BF} = 2$ рад/с, $\alpha = 30°$,
$AB = 30$, $BC = 30$,
$NB = 50$, $NF = 40$,
$CD = 40$, $EH = 30$,
$FE = 35$, $FG = 10$,
$OA = 30$, $KG = 25$.
a_A, a_B, a_C – ?

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	60.000	52.915	51.962	10.000	36.056	27.839	30.000	10.000
2	90.000	77.942	90.000	45.000	62.650	51.962	60.000	5.000
3	80.000	69.282	72.111	20.000	44.542	34.641	40.000	48.000
4	30.000	25.981	30.000	15.000	14.156	12.990	15.000	1.875
5	184.752	174.356	160.000	69.282	268.766	145.547	147.802	162.428
6	115.470	100.000	104.083	28.868	166.458	50.000	57.735	187.639
7	50.000	43.301	50.000	25.000	48.814	21.651	25.000	31.250
8	16.667	14.434	16.667	8.333	28.641	21.651	25.000	31.250
9	100.000	86.603	90.139	25.000	144.157	43.301	50.000	162.500
10	21.213	15.811	15.000	5.000	14.577	9.014	10.607	5.000
11	84.853	60.000	189.737	180.000	109.202	30.000	42.426	75.000
12	60.000	54.083	51.962	15.000	122.780	30.000	30.000	105.000
13	30.000	23.717	21.213	10.607	66.503	11.859	7.500	71.595
14	100.000	86.603	100.000	50.000	57.282	43.301	50.000	62.500
15	40.000	35.277	34.641	6.667	24.037	18.559	20.000	26.667
16	30.000	21.213	22.847	8.485	7.299	4.243	6.000	1.697
17	56.569	42.164	40.000	13.333	18.367	15.549	11.314	8.533
18	28.868	25.338	25.000	4.124	17.158	13.163	14.434	18.970
19	300.000	259.808	300.000	150.000	146.442	64.952	75.000	168.750
20	51.962	45.608	45.000	7.423	88.559	36.757	41.569	101.696
21	17.321	15.275	15.000	2.887	11.026	8.036	8.660	3.753
22	57.735	50.000	100.000	86.603	48.228	40.000	46.188	3.849
23	75.000	64.952	75.000	37.500	54.083	51.962	60.000	45.000
24	30.000	22.062	21.213	6.061	20.270	12.216	15.000	6.667
25	60.000	51.962	60.000	30.000	27.042	25.981	30.000	7.500
26	80.000	75.498	69.282	30.000	57.000	51.264	48.000	15.000
27	200.000	173.205	346.410	300.000	123.111	86.603	100.000	137.500
28	141.421	100.000	107.703	40.000	86.023	50.000	70.711	120.000
29	84.853	60.000	84.853	60.000	216.333	120.000	169.706	60.000
30	115.470	100.000	115.470	57.735	180.370	80.000	92.376	207.846

К9 файл o9k6A

№	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	3.000	-1.000	–	-0.520	1.000	1.200	-1.000	-2.078	1.800	1.118	1.614	–	–	–
2	3.000	1.500	1.949	1.299	1.000	3.000	2.000	–	2.700	1.217	0.313	–	–	–
3	4.000	-2.000	-2.771	-0.693	0.800	1.600	-1.333	–	3.200	2.448	3.503	–	–	–
4	1.000	0.500	0.433	0.433	-0.375	-0.600	0.500	–	0.300	0.135	0.035	–	–	–
5	-9.238	2.309	–	3.200	4.773	7.390	4.927	4.000	21.047	14.194	6.400	–	–	–
6	-5.774	2.887	4.000	1.000	2.887	-2.309	-1.925	–	8.819	1.000	5.889	–	–	–
7	-1.667	-0.833	2.887	-0.722	-1.250	1.000	-0.833	–	–	–	–	1.679	0.322	0.250
8	0.556	0.278	0.962	-0.722	-1.250	1.000	-0.833	–	–	–	–	0.882	0.322	0.250
9	5.000	-2.500	-5.774	0.866	-2.500	2.000	1.667	–	–	–	–	3.848	1.186	1.000
10	1.061	-0.500	–	-0.150	0.500	0.424	-0.354	1.000	0.400	0.232	0.150	–	–	–
11	4.243	-6.000	-4.000	1.000	-3.000	1.697	-1.414	–	9.407	0.600	26.021	–	–	–
12	2.000	0.500	–	0.866	3.000	-1.200	1.000	-3.464	1.200	0.648	1.855	–	–	–
13	1.000	0.354	–	0.354	1.591	-0.300	-0.250	0.354	0.300	0.226	0.156	–	–	–
14	3.333	1.667	2.165	1.443	-2.500	2.000	-1.667	–	–	–	–	2.079	1.287	1.000
15	2.000	-0.667	–	0.346	0.667	0.800	0.667	-2.309	0.800	0.575	0.961	–	–	–
16	1.000	0.849	-1.414	0.212	-0.170	-0.240	0.200	–	0.300	0.055	0.045	–	–	–
17	2.828	-1.333	–	0.400	0.853	0.453	-0.377	1.000	2.846	1.212	0.400	–	–	–
18	-0.962	-0.412	–	0.250	0.454	-0.577	0.481	1.000	0.293	0.098	0.250	–	–	–
19	-10.000	-5.000	17.321	-4.330	-3.750	3.000	2.500	–	–	–	–	20.854	3.784	2.250
20	1.732	0.742	–	-0.450	1.336	-1.663	-1.386	3.000	0.948	1.231	1.350	–	–	–
21	0.866	-0.289	–	-0.150	-0.144	0.346	0.289	1.000	0.189	0.163	0.150	–	–	–
22	-2.887	2.887	1.250	1.000	0.770	2.309	1.540	–	2.546	0.500	9.550	–	–	–
23	-2.500	-1.250	1.624	1.299	1.000	3.000	2.000	–	–	–	–	0.507	0.903	1.800
24	1.000	0.606	–	-0.212	-0.667	-0.600	0.500	-0.849	0.300	0.138	0.198	–	–	–
25	2.000	1.000	-3.464	0.866	0.500	1.500	-1.000	–	1.200	0.541	0.139	–	–	–
26	4.000	-1.000	–	-1.386	-0.600	-1.920	1.600	-1.732	3.200	2.460	2.332	–	–	–
27	-10.000	10.000	-2.887	-2.887	2.500	4.000	-3.333	–	–	–	–	13.017	2.610	4.000
28	-4.714	-4.000	-6.667	1.000	-2.000	-2.828	-2.357	–	6.743	1.000	3.913	–	–	–
29	-2.828	-2.000	-4.000	3.000	-12.000	6.788	5.657	–	2.501	1.800	5.917	–	–	–
30	-3.849	-1.925	2.500	2.000	-4.619	3.695	3.079	–	4.626	2.000	8.563	–	–	–