

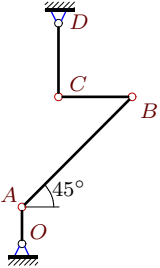
## Уравнение трех угловых ускорений. Две степени свободы

В указанном положении механизма заданы угловые скорости и ускорения двух звеньев. Длины звеньев даны в сантиметрах. Звенья, направление которых не указано, принимать вертикальными или горизонтальными. Найти угловые ускорения звеньев механизма.

Кирсанов М.Н. **Решебник. Теоретическая механика**/Под ред. А. И. Кириллова.– М.: ФИЗМАТЛИТ, 2008. – 384 с. (с.183.)

### Задача К20.1.

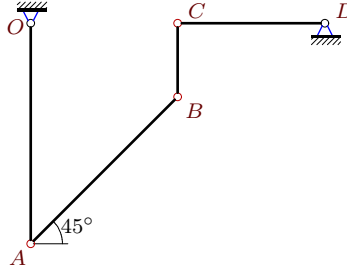
5



$$\begin{aligned} \omega_{OAz} &= -6 \text{ рад/с}, \quad \omega_{CDz} = 12 \text{ рад/с}, \\ \varepsilon_{OAz} &= 6 \text{ рад/с}^2, \quad \varepsilon_{BCz} = -192 \text{ рад/с}^2, \\ OA &= 1, \quad AB = 3\sqrt{2}, \quad BC = CD = 2. \end{aligned}$$

### Задача К20.2.

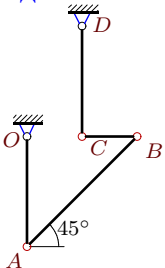
5



$$\begin{aligned} \omega_{OAz} &= -2 \text{ рад/с}, \quad \omega_{BCz} = 2 \text{ рад/с}, \\ \varepsilon_{BCz} &= -100 \text{ рад/с}^2, \quad \varepsilon_{CDz} = 0, \\ OA &= 3, \quad AB = 2\sqrt{2}, \quad BC = 1, \quad CD = 2. \end{aligned}$$

### Задача К20.3.

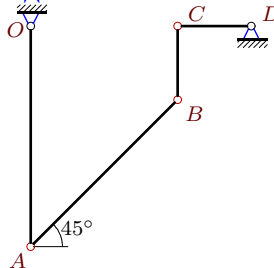
5



$$\begin{aligned} \omega_{OAz} &= -2 \text{ рад/с}, \quad \omega_{CDz} = -4 \text{ рад/с}, \\ \varepsilon_{OAz} &= -2 \text{ рад/с}^2, \quad \varepsilon_{CDz} = 2 \text{ рад/с}^2, \\ OA &= 2, \quad AB = 2\sqrt{2}, \quad BC = 1, \quad CD = 2. \end{aligned}$$

### Задача К20.4.

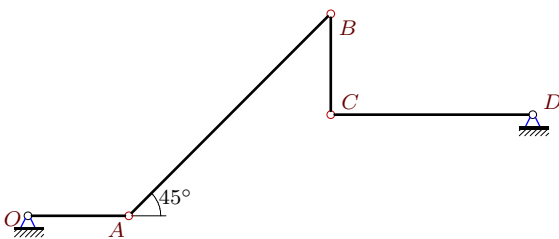
5



$$\begin{aligned} \omega_{OAz} &= -2 \text{ рад/с}, \quad \omega_{CDz} = 2 \text{ рад/с}, \\ \varepsilon_{BCz} &= -22 \text{ рад/с}^2, \quad \varepsilon_{CDz} = 2 \text{ рад/с}^2, \\ OA &= 3, \quad AB = 2\sqrt{2}, \quad BC = CD = 1. \end{aligned}$$

### Задача К20.5.

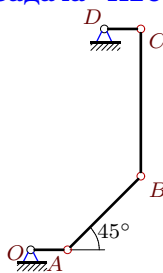
5



$$\begin{aligned} \omega_{OAz} &= 2 \text{ рад/с}, \quad \omega_{BCz} = -2 \text{ рад/с}, \\ \varepsilon_{OAz} &= 0, \quad \varepsilon_{CDz} = -2 \text{ рад/с}^2, \\ OA &= 1, \quad AB = 2\sqrt{2}, \quad BC = 1, \quad CD = 2. \end{aligned}$$

### Задача К20.6.

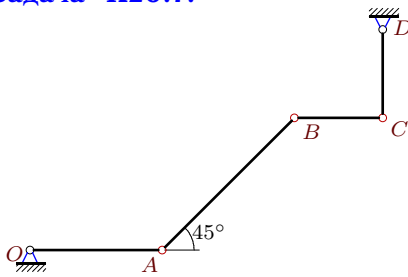
5



$$\begin{aligned} \omega_{OAz} &= -8 \text{ рад/с}, \quad \omega_{BCz} = -2 \text{ рад/с}, \\ \varepsilon_{OAz} &= 0, \quad \varepsilon_{BCz} = -34 \text{ рад/с}^2, \\ OA &= 1, \quad AB = 2\sqrt{2}, \quad BC = 4, \quad CD = 1. \end{aligned}$$

**Задача K20.7.**

5



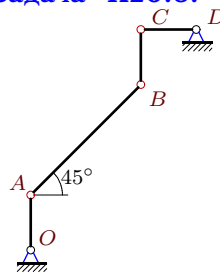
$$\omega_{BCz} = 3 \text{ рад/с}, \omega_{CDz} = 12 \text{ рад/с},$$

$$\varepsilon_{BCz} = 375 \text{ рад/с}^2, \varepsilon_{CDz} = -6 \text{ рад/с}^2,$$

$$OA = 3, AB = 3\sqrt{2}, BC = CD = 2.$$

**Задача K20.8.**

5



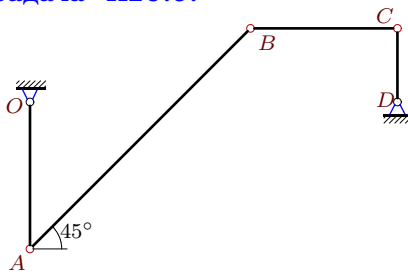
$$\omega_{OAz} = -2 \text{ рад/с}, \omega_{CDz} = 2 \text{ рад/с},$$

$$\varepsilon_{OAz} = 2 \text{ рад/с}^2, \varepsilon_{BCz} = -28 \text{ рад/с}^2,$$

$$OA = 1, AB = 2\sqrt{2}, BC = CD = 1.$$

**Задача K20.9.**

5



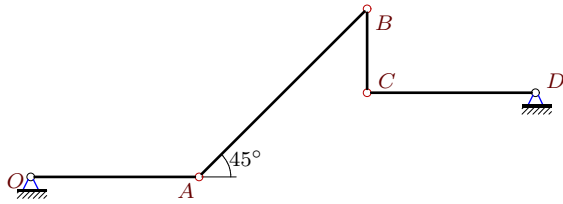
$$\omega_{BCz} = -6 \text{ рад/с}, \omega_{CDz} = 0,$$

$$\varepsilon_{OAz} = \varepsilon_{CDz} = 6 \text{ рад/с}^2,$$

$$OA = 2, AB = 3\sqrt{2}, BC = 2, CD = 1.$$

**Задача K20.10.**

5



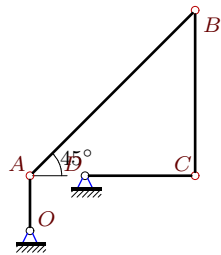
$$\omega_{BCz} = -12 \text{ рад/с}, \omega_{CDz} = 4 \text{ рад/с},$$

$$\varepsilon_{BCz} = 40 \text{ рад/с}^2, \varepsilon_{CDz} = -2 \text{ рад/с}^2,$$

$$OA = 2, AB = 2\sqrt{2}, BC = 1, CD = 2.$$

**Задача K20.11.**

5



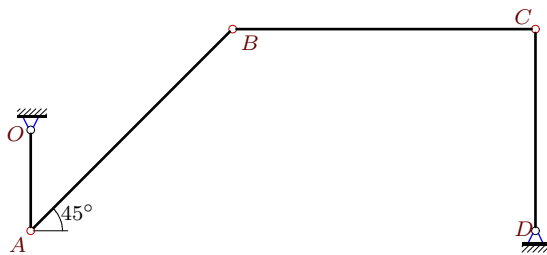
$$\omega_{OAz} = 9 \text{ рад/с}, \omega_{BCz} = 3 \text{ рад/с},$$

$$\varepsilon_{OAz} = -9 \text{ рад/с}^2, \varepsilon_{BCz} = 27 \text{ рад/с}^2,$$

$$OA = 1, AB = 3\sqrt{2}, BC = 3, CD = 2.$$

**Задача K20.12.**

5



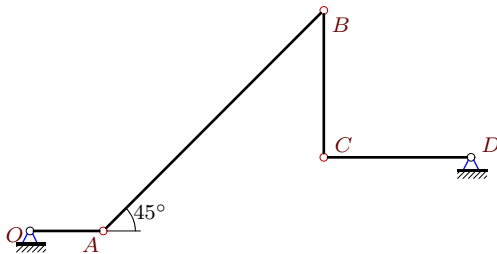
$$\omega_{BCz} = -2 \text{ рад/с}, \omega_{CDz} = 0,$$

$$\varepsilon_{OAz} = 0, \varepsilon_{CDz} = 6 \text{ рад/с}^2,$$

$$OA = 1, AB = 2\sqrt{2}, BC = 3, CD = 2.$$

**Задача K20.13.**

5



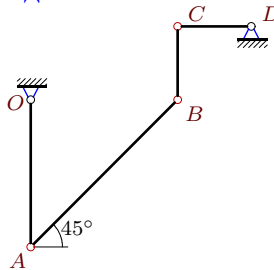
$$\omega_{OAz} = 6 \text{ рад/с}, \omega_{BCz} = 9 \text{ рад/с},$$

$$\varepsilon_{OAz} = 0, \varepsilon_{CDz} = 12 \text{ рад/с}^2,$$

$$OA = 1, AB = 3\sqrt{2}, BC = CD = 2.$$

**Задача K20.14.**

5



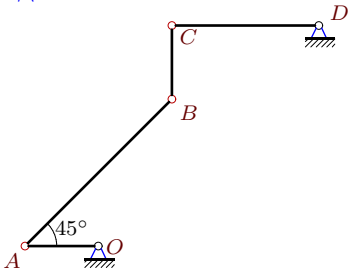
$$\omega_{BCz} = -6 \text{ рад/с}, \omega_{CDz} = -2 \text{ рад/с},$$

$$\varepsilon_{OAz} = -2 \text{ рад/с}^2, \varepsilon_{CDz} = 2 \text{ рад/с}^2,$$

$$OA = 2, AB = 2\sqrt{2}, BC = CD = 1.$$

**Задача K20.15.**

5



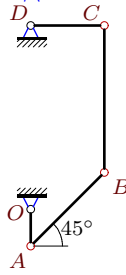
$$\omega_{OAz} = -2 \text{ рад/с}, \omega_{CDz} = 0,$$

$$\varepsilon_{OAz} = 2 \text{ рад/с}^2, \varepsilon_{CDz} = -2 \text{ рад/с}^2,$$

$$OA = 1, AB = 2\sqrt{2}, BC = 1, CD = 2.$$

**Задача K20.16.**

5



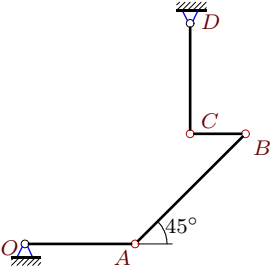
$$\omega_{OAz} = -8 \text{ рад/с}, \omega_{BCz} = -10 \text{ рад/с},$$

$$\varepsilon_{OAz} = 0, \varepsilon_{CDz} = -8 \text{ рад/с}^2,$$

$$OA = 1, AB = 2\sqrt{2}, BC = 4, CD = 2.$$

**Задача K20.17.**

5



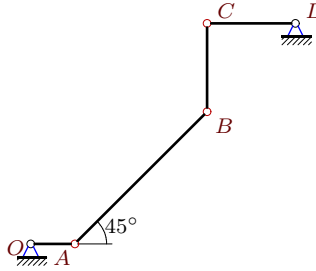
$$\omega_{BCz} = -12 \text{ рад/с}, \omega_{CDz} = 4 \text{ рад/с},$$

$$\varepsilon_{OAz} = -2 \text{ рад/с}^2, \varepsilon_{BCz} = 32 \text{ рад/с}^2,$$

$$OA = 2, AB = 2\sqrt{2}, BC = 1, CD = 2.$$

**Задача K20.18.**

5



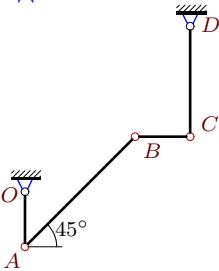
$$\omega_{BCz} = -3 \text{ рад/с}, \omega_{CDz} = 0,$$

$$\varepsilon_{OAz} = -18 \text{ рад/с}^2, \varepsilon_{BCz} = -54 \text{ рад/с}^2,$$

$$OA = 1, AB = 3\sqrt{2}, BC = CD = 2.$$

**Задача K20.19.**

5



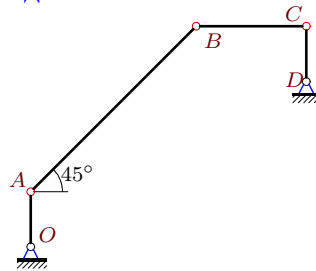
$$\omega_{OAz} = 2 \text{ рад/с}, \omega_{CDz} = 4 \text{ рад/с},$$

$$\varepsilon_{BCz} = 94 \text{ рад/с}^2, \varepsilon_{CDz} = 0,$$

$$OA = 1, AB = 2\sqrt{2}, BC = 1, CD = 2.$$

**Задача K20.20.**

5



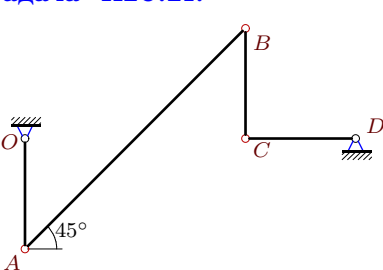
$$\omega_{BCz} = 6 \text{ рад/с}, \omega_{CDz} = -6 \text{ рад/с},$$

$$\varepsilon_{OAz} = -6 \text{ рад/с}^2, \varepsilon_{CDz} = 12 \text{ рад/с}^2,$$

$$OA = 1, AB = 3\sqrt{2}, BC = 2, CD = 1.$$

**Задача K20.21.**

5



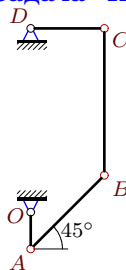
$$\omega_{OAz} = \omega_{CDz} = 2 \text{ рад/с},$$

$$\varepsilon_{OAz} = 0, \varepsilon_{CDz} = 4 \text{ рад/с}^2,$$

$$OA = 1, AB = 2\sqrt{2}, BC = CD = 1.$$

**Задача K20.22.**

5



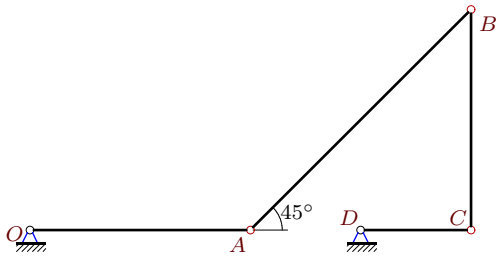
$$\omega_{OAz} = -8 \text{ рад/с}, \omega_{BCz} = 6 \text{ рад/с},$$

$$\varepsilon_{OAz} = -16 \text{ рад/с}^2, \varepsilon_{BCz} = -148 \text{ рад/с}^2,$$

$$OA = 1, AB = 2\sqrt{2}, BC = 4, CD = 2.$$

**Задача K20.23.**

5



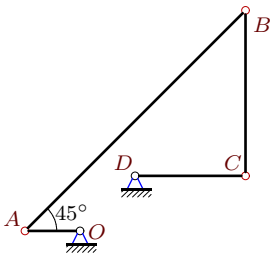
$$\omega_{BCz} = -6 \text{ рад/с}, \omega_{CDz} = -4 \text{ рад/с},$$

$$\varepsilon_{BCz} = 40 \text{ рад/с}^2, \varepsilon_{CDz} = 0,$$

$$OA = 2, AB = 2\sqrt{2}, BC = 2, CD = 1.$$

**Задача K20.25.**

5



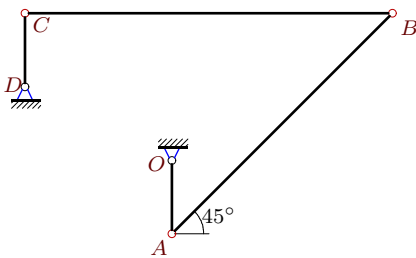
$$\omega_{BCz} = -12 \text{ рад/с}, \omega_{CDz} = -24 \text{ рад/с},$$

$$\varepsilon_{OAz} = -12 \text{ рад/с}^2, \varepsilon_{BCz} = -364 \text{ рад/с}^2,$$

$$OA = 1, AB = 4\sqrt{2}, BC = 3, CD = 2.$$

**Задача K20.27.**

5



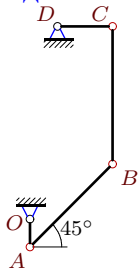
$$\omega_{BCz} = -3 \text{ рад/с}, \omega_{CDz} = 0,$$

$$\varepsilon_{BCz} = 18 \text{ рад/с}^2, \varepsilon_{CDz} = -15 \text{ рад/с}^2,$$

$$OA = 1, AB = 3\sqrt{2}, BC = 5, CD = 1.$$

**Задача K20.29.**

5



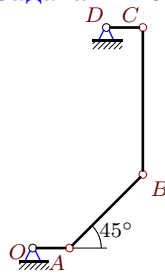
$$\omega_{OAz} = -15 \text{ рад/с}, \omega_{BCz} = 9 \text{ рад/с},$$

$$\varepsilon_{BCz} = -150 \text{ рад/с}^2, \varepsilon_{CDz} = -30 \text{ рад/с}^2,$$

$$OA = 1, AB = 3\sqrt{2}, BC = 5, CD = 2.$$

**Задача K20.24.**

5



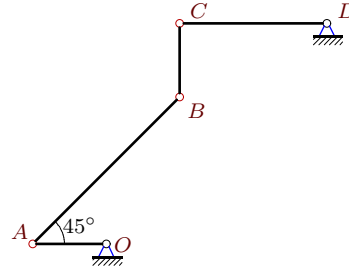
$$\omega_{OAz} = -8 \text{ рад/с}, \omega_{BCz} = -2 \text{ рад/с},$$

$$\varepsilon_{OAz} = -8 \text{ рад/с}^2, \varepsilon_{CDz} = 8 \text{ рад/с}^2,$$

$$OA = 1, AB = 2\sqrt{2}, BC = 4, CD = 1.$$

**Задача K20.26.**

5



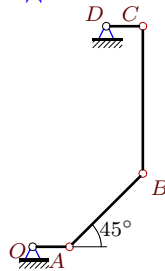
$$\omega_{BCz} = 2 \text{ рад/с}, \omega_{CDz} = 0,$$

$$\varepsilon_{BCz} = -10 \text{ рад/с}^2, \varepsilon_{CDz} = -2 \text{ рад/с}^2,$$

$$OA = 1, AB = 2\sqrt{2}, BC = 1, CD = 2.$$

**Задача K20.28.**

5



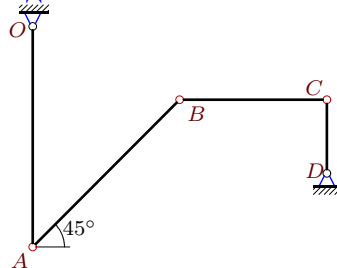
$$\omega_{BCz} = -2 \text{ рад/с}, \omega_{CDz} = 0,$$

$$\varepsilon_{OAz} = 8 \text{ рад/с}^2, \varepsilon_{BCz} = -36 \text{ рад/с}^2,$$

$$OA = 1, AB = 2\sqrt{2}, BC = 4, CD = 1.$$

**Задача K20.30.**

5



$$\omega_{BCz} = -6 \text{ рад/с}, \omega_{CDz} = 0,$$

$$\varepsilon_{BCz} = 74 \text{ рад/с}^2, \varepsilon_{CDz} = -4 \text{ рад/с}^2,$$

$$OA = 3, AB = 2\sqrt{2}, BC = 2, CD = 1.$$

**К20 Ответы.****Уравнение трех угловых ускорений. Две степени свободы**

13.04.2012

№	$\omega_{OAz}$	$\omega_{ABz}$	$\omega_{BCz}$	$\omega_{CDz}$	$\varepsilon_{OA}$	$\varepsilon_{AB}$	$\varepsilon_{BC}$	$\varepsilon_{CD}$
1	—	-6	-9	—	—	16	—	0
2	—	-4	—	4	-4	12	—	—
3	—	2	4	—	—	0	-32	—
4	—	-1	-4	—	-4	2	—	—
5	—	-1	—	0	—	1	8	—
6	—	4	—	0	—	20	—	-8
7	6	-8	—	—	12	-102	—	—
8	—	-1	4	—	—	10	—	2
9	6	4	—	—	—	-34	39	—
10	2	-6	—	—	2	-36	—	—
11	—	0	—	0	—	30	—	18
12	6	3	—	—	—	-9	0	—
13	—	6	—	-12	—	-26	177	—
14	-2	1	—	—	—	14	-38	—
15	—	-1	2	—	—	6	-10	—
16	—	16	—	16	—	416	-208	—
17	-2	-4	—	—	—	50	—	2
18	-6	2	—	—	—	20	—	-6
19	—	-3	6	—	6	-24	—	—
20	6	-4	—	—	—	-34	75	—
21	—	-1	-4	—	—	-11	-16	—
22	—	-16	—	-16	—	288	—	-8
23	4	-6	—	—	4	-4	—	—
24	—	4	—	0	—	32	-40	—
25	12	-9	—	—	—	-30	—	0
26	-2	-1	—	—	2	6	—	—
27	-15	-5	—	—	-15	-20	—	—
28	-8	4	—	—	—	24	—	8
29	—	-20	—	-30	-30	440	—	—
30	4	6	—	—	8	-62	—	—

К20 файл о20к5А