

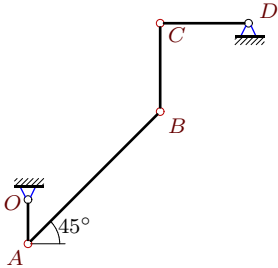
## Уравнение трех угловых ускорений. Две степени свободы

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 K20.1.

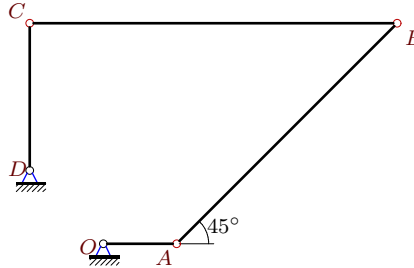
9



$$\begin{aligned} \omega_{BCz} &= -3 \text{ рад/с}, \quad \omega_{CDz} = 0, \\ \varepsilon_{BCz} &= 3 \text{ рад/с}^2, \quad \varepsilon_{CDz} = -6 \text{ рад/с}^2, \\ OA &= 1, \quad AB = 3\sqrt{2}, \quad BC = CD = 2. \end{aligned}$$

### Задача K20.2.

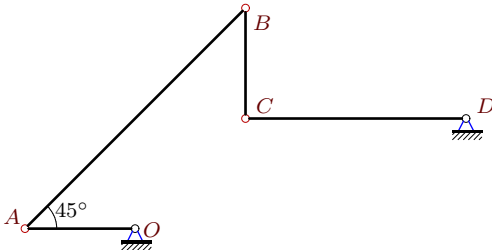
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$$\begin{aligned} \omega_{OAz} &= -15 \text{ рад/с}, \quad \omega_{BCz} = -3 \text{ рад/с}, \\ \varepsilon_{OAz} &= 15 \text{ рад/с}^2, \quad \varepsilon_{BCz} = -45 \text{ рад/с}^2, \\ OA &= 1, \quad AB = 3\sqrt{2}, \quad BC = 5, \quad CD = 2. \end{aligned}$$

### Задача K20.3.

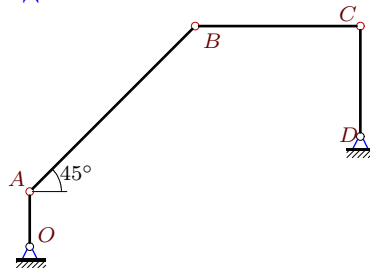
9



$$\begin{aligned} \omega_{OAz} &= 2 \text{ рад/с}, \quad \omega_{CDz} = 0, \\ \varepsilon_{BCz} &= -14 \text{ рад/с}^2, \quad \varepsilon_{CDz} = 4 \text{ рад/с}^2, \\ OA &= 1, \quad AB = 2\sqrt{2}, \quad BC = 1, \quad CD = 2. \end{aligned}$$

### Задача K20.4.

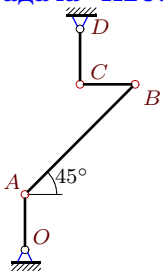
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$$\begin{aligned} \omega_{OAz} &= 9 \text{ рад/с}, \quad \omega_{BCz} = 3 \text{ рад/с}, \\ \varepsilon_{OAz} &= -9 \text{ рад/с}^2, \quad \varepsilon_{BCz} = 45 \text{ рад/с}^2, \\ OA &= 1, \quad AB = 3\sqrt{2}, \quad BC = 3, \quad CD = 2. \end{aligned}$$

### Задача K20.5.

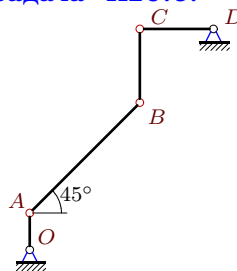
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$$\begin{aligned} \omega_{OAz} &= -2 \text{ рад/с}, \quad \omega_{BCz} = 4 \text{ рад/с}, \\ \varepsilon_{BCz} &= -12 \text{ рад/с}^2, \quad \varepsilon_{CDz} = 2 \text{ рад/с}^2, \\ OA &= 1, \quad AB = 2\sqrt{2}, \quad BC = CD = 1. \end{aligned}$$

### Задача K20.6.

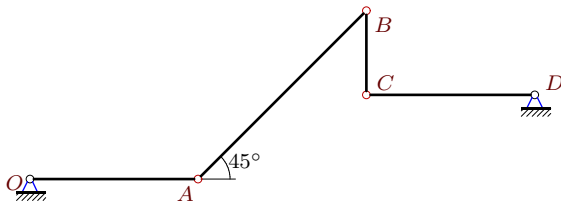
9



$$\begin{aligned} \omega_{OAz} &= -6 \text{ рад/с}, \quad \omega_{BCz} = 3 \text{ рад/с}, \\ \varepsilon_{BCz} &= -24 \text{ рад/с}^2, \quad \varepsilon_{CDz} = 6 \text{ рад/с}^2, \\ OA &= 1, \quad AB = 3\sqrt{2}, \quad BC = CD = 2. \end{aligned}$$

**Задача K20.7.**

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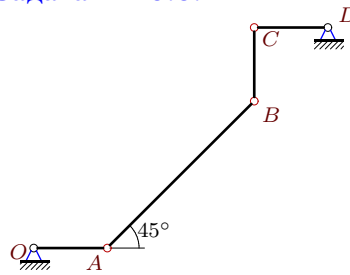
$$\omega_{OAz} = 2 \text{ рад/с}, \omega_{BCz} = -4 \text{ рад/с},$$

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

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

**Задача K20.8.**

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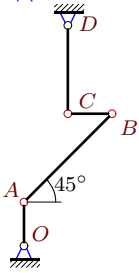
$$\omega_{OAz} = \omega_{CDz} = -2 \text{ рад/с},$$

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

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

**Задача K20.9.**

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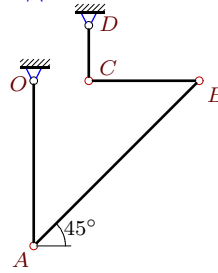
$$\omega_{OAz} = -2 \text{ рад/с}, \omega_{BCz} = 2 \text{ рад/с},$$

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

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

**Задача K20.10.**

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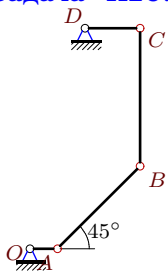
$$\omega_{OAz} = \omega_{BCz} = -6 \text{ рад/с},$$

$$\varepsilon_{OAz} = -12 \text{ рад/с}^2, \varepsilon_{BCz} = 9 \text{ рад/с}^2,$$

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

**Задача K20.11.**

9



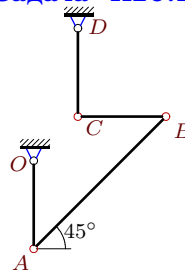
$$\omega_{OAz} = -15 \text{ рад/с}, \omega_{CDz} = -30 \text{ рад/с},$$

$$\varepsilon_{OAz} = -45 \text{ рад/с}^2, \varepsilon_{CDz} = 0,$$

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

**Задача K20.12.**

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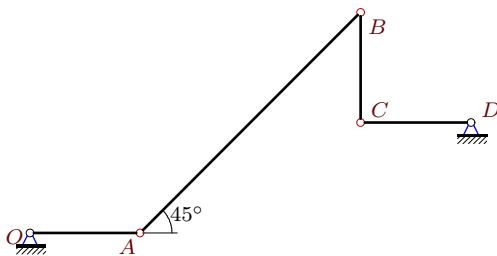
$$\omega_{BCz} = -6 \text{ рад/с}, \omega_{CDz} = 0,$$

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

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

**Задача K20.13.**

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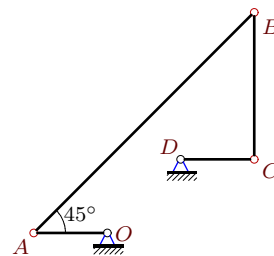
$$\omega_{OAz} = 2 \text{ рад/с}, \omega_{BCz} = -2 \text{ рад/с},$$

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

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

**Задача K20.14.**

9



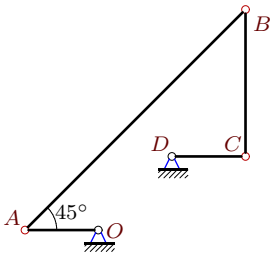
$$\omega_{OAz} = 6 \text{ рад/с}, \omega_{CDz} = 0,$$

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

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

**Задача K20.15.**

9



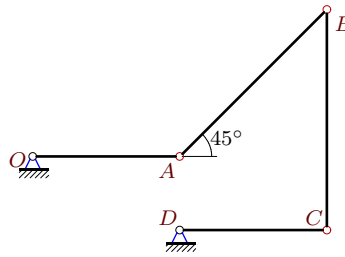
$$\omega_{BCz} = 0, \omega_{CDz} = -6 \text{ рад/с},$$

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

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

**Задача K20.16.**

9



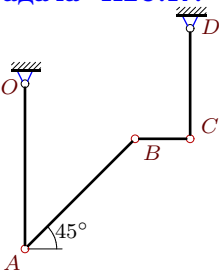
$$\omega_{OAz} = 6 \text{ рад/с}, \omega_{BCz} = -12 \text{ рад/с},$$

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

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

**Задача K20.17.**

9



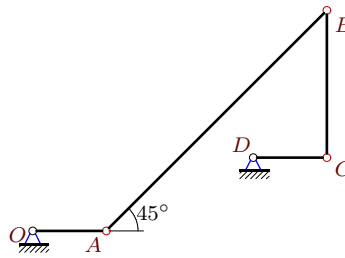
$$\omega_{OAz} = 2 \text{ рад/с}, \omega_{BCz} = -14 \text{ рад/с},$$

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

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

**Задача K20.18.**

9



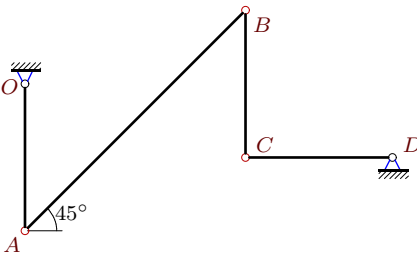
$$\omega_{BCz} = \omega_{CDz} = -6 \text{ рад/с},$$

$$\varepsilon_{BCz} = 3 \text{ рад/с}^2, \varepsilon_{CDz} = 0,$$

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

**Задача K20.19.**

9



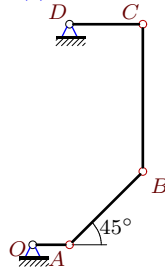
$$\omega_{OAz} = 6 \text{ рад/с}, \omega_{BCz} = -6 \text{ рад/с},$$

$$\varepsilon_{BCz} = -84 \text{ рад/с}^2, \varepsilon_{CDz} = 6 \text{ рад/с}^2,$$

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

**Задача K20.20.**

9



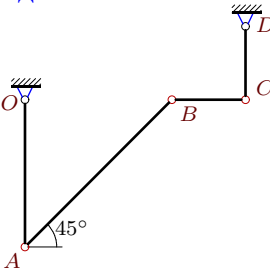
$$\omega_{BCz} = -10 \text{ рад/с}, \omega_{CDz} = 16 \text{ рад/с},$$

$$\varepsilon_{BCz} = -390 \text{ рад/с}^2, \varepsilon_{CDz} = 0,$$

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

**Задача K20.21.**

9



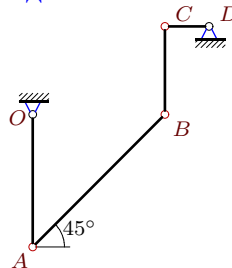
$$\omega_{BCz} = -4 \text{ рад/с}, \omega_{CDz} = 0,$$

$$\varepsilon_{BCz} = 22 \text{ рад/с}^2, \varepsilon_{CDz} = 2 \text{ рад/с}^2,$$

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

**Задача K20.22.**

9



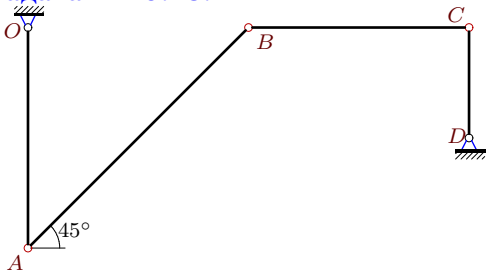
$$\omega_{OAz} = -6 \text{ рад/с}, \omega_{CDz} = 0,$$

$$\varepsilon_{BCz} = -42 \text{ рад/с}^2, \varepsilon_{CDz} = 6 \text{ рад/с}^2,$$

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

**Задача K20.23.**

9



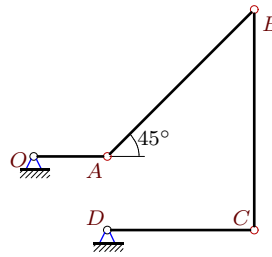
$$\omega_{BCz} = -4 \text{ рад/с}, \omega_{CDz} = 0,$$

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

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

**Задача K20.24.**

9



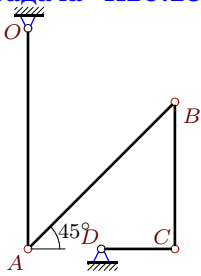
$$\omega_{OAz} = \omega_{BCz} = 6 \text{ рад/с},$$

$$\varepsilon_{BCz} = -4 \text{ рад/с}^2, \varepsilon_{CDz} = 12 \text{ рад/с}^2,$$

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

**Задача K20.25.**

9



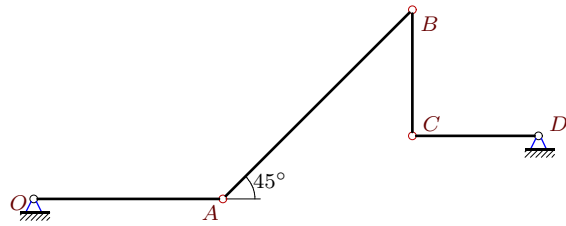
$$\omega_{OAz} = 4 \text{ рад/с}, \omega_{BCz} = -6 \text{ рад/с},$$

$$\varepsilon_{BCz} = -70 \text{ рад/с}^2, \varepsilon_{CDz} = 4 \text{ рад/с}^2,$$

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

**Задача K20.26.**

9



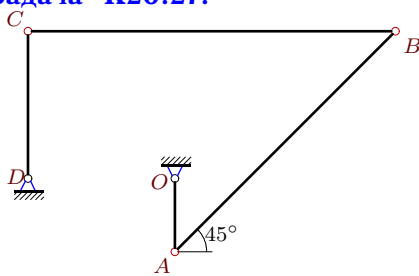
$$\omega_{BCz} = -9 \text{ рад/с}, \omega_{CDz} = 0,$$

$$\varepsilon_{OAz} = 12 \text{ рад/с}^2, \varepsilon_{BCz} = 57 \text{ рад/с}^2,$$

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

**Задача K20.27.**

9



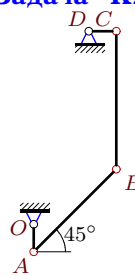
$$\omega_{OAz} = -15 \text{ рад/с}, \omega_{CDz} = 30 \text{ рад/с},$$

$$\varepsilon_{OAz} = 15 \text{ рад/с}^2, \varepsilon_{BCz} = 207 \text{ рад/с}^2,$$

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

**Задача K20.28.**

9



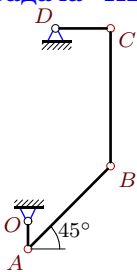
$$\omega_{OAz} = -15 \text{ рад/с}, \omega_{CDz} = 0,$$

$$\varepsilon_{OAz} = 15 \text{ рад/с}^2, \varepsilon_{BCz} = 45 \text{ рад/с}^2,$$

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

**Задача K20.29.**

9



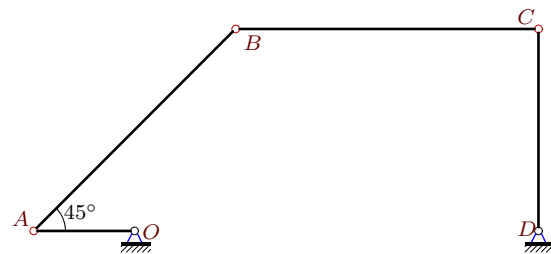
$$\omega_{OAz} = -15 \text{ рад/с}, \omega_{CDz} = -30 \text{ рад/с},$$

$$\varepsilon_{OAz} = 0, \varepsilon_{CDz} = -30 \text{ рад/с}^2,$$

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

**Задача K20.30.**

9



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

$$\varepsilon_{BCz} = -18 \text{ рад/с}^2, \varepsilon_{CDz} = 12 \text{ рад/с}^2,$$

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

**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	0	—	—	0	-2	—	—
2	—	0	—	0	—	-80	—	-30
3	—	1	2	—	-2	-6	—	—
4	—	-3	—	0	—	-9	—	9
5	—	2	—	-2	2	2	—	—
6	—	0	—	0	6	14	—	—
7	—	-2	—	0	2	-10	—	—
8	—	2	-4	—	—	13	-42	—
9	—	1	—	0	2	2	—	—
10	—	-4	—	-6	—	-2	—	-6
11	—	-15	9	—	—	375	-45	—
12	-6	-4	—	—	-6	0	—	—
13	—	-1	—	0	—	-2	2	—
14	—	2	3	—	—	-2	-15	—
15	6	0	—	—	—	2	-33	—
16	—	-18	—	-12	—	102	212	—
17	—	7	—	-4	—	-143	404	—
18	6	-4	—	—	18	-14	—	—
19	—	0	—	0	6	-52	—	—
20	-8	20	—	—	-8	604	—	—
21	2	2	—	—	2	-11	—	—
22	—	0	-9	—	-12	16	—	—
23	4	4	—	—	—	-26	26	—
24	—	9	—	12	0	39	—	—
25	—	0	—	0	8	-58	—	—
26	6	-6	—	—	—	-34	—	6
27	—	15	9	—	—	-105	—	-30
28	—	0	-3	—	—	-70	—	-30
29	—	-20	9	—	—	440	-144	—
30	—	0	—	0	-6	24	—	—

К20 файл о20к9А