

Кинематика плоского механизма

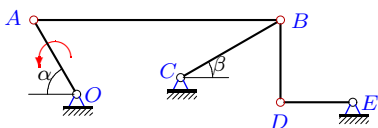
Многочленный механизм приводится в движение кривошипом OA , вращающимся с известной угловой скоростью и случайным угловым ускорением с известным рядом распределения $p = [0.2, 0.3, 0.4, 0.1]$. Найти математическое ожидание угловых ускорений звеньев.

Длины звеньев даны в см, угловые скорости — в рад/с, угловые ускорения — в рад/с². Стержни, положение которых не определено углом, вертикальны или горизонтальны.

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

Задача L-30.1.

1



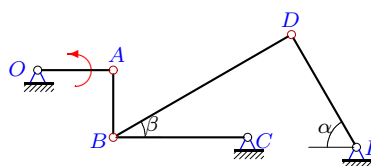
$$\varepsilon_{OA} = [3, 3.2, 3.6, 4],$$

$$\omega_{OA} = 1, \alpha = 60^\circ, \beta = 30^\circ, OA = 26,$$

$$AB = 75, BC = 35, BD = 25, DE = 22.$$

Задача L-30.2.

1



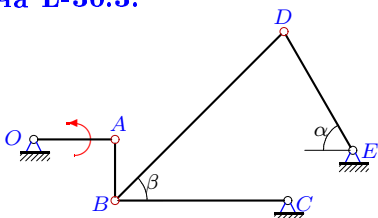
$$\varepsilon_{OA} = [4, 4.3, 4.7, 5.2],$$

$$\omega_{OA} = 4, \alpha = 60^\circ, \beta = 30^\circ, OA = 18,$$

$$AB = 16, BC = 32, BD = 49, DE = 31.$$

Задача L-30.3.

1



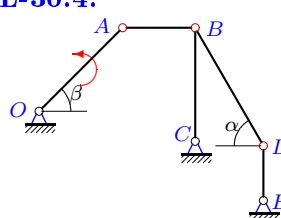
$$\varepsilon_{OA} = [3, 3.3, 3.6, 4.1],$$

$$\omega_{OA} = 2, \alpha = 60^\circ, \beta = 45^\circ, OA = 16,$$

$$AB = 12, BC = 34, BD = 47, DE = 27.$$

Задача L-30.4.

1



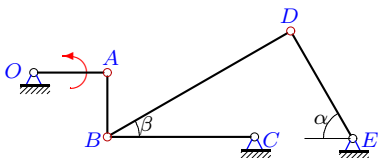
$$\varepsilon_{OA} = [3, 3.3, 3.6, 4],$$

$$\omega_{OA} = 1, \alpha = 60^\circ, \beta = 45^\circ, OA = 26,$$

$$AB = 16, BC = 25, BD = 30, DE = 12.$$

Задача L-30.5.

1



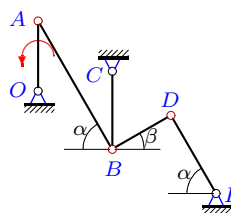
$$\varepsilon_{OA} = [3, 3.3, 3.7, 4.1],$$

$$\omega_{OA} = 1, \alpha = 60^\circ, \beta = 30^\circ, OA = 16,$$

$$AB = 14, BC = 32, BD = 46, DE = 27.$$

Задача L-30.6.

1



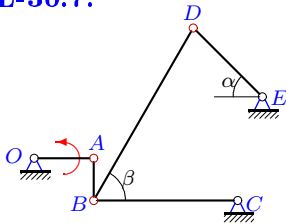
$$\varepsilon_{OA} = [4, 4.2, 4.6, 5],$$

$$\omega_{OA} = 3, \alpha = 60^\circ, \beta = 30^\circ, OA = 28,$$

$$AB = 59, BC = 31, BD = 27, DE = 36.$$

Задача L-30.7.

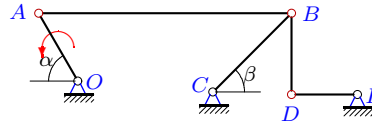
1



$\varepsilon_{OA} = [2, 2.3, 2.7, 3.2]$,
 $\omega_{OA}=2$, $\alpha=45^\circ$, $\beta=60^\circ$, $OA=14$,
 $AB=10$, $BC=34$, $BD=47$, $DE=23$.

Задача L-30.8.

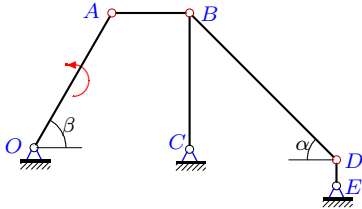
1



$\varepsilon_{OA} = [3, 3.3, 3.6, 4.1]$,
 $\omega_{OA}=3$, $\alpha=60^\circ$, $\beta=45^\circ$, $OA=26$,
 $AB=84$, $BC=37$, $BD=27$, $DE=22$.

Задача L-30.9.

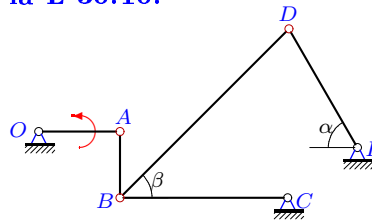
1



$\varepsilon_{OA} = [2, 2.2, 2.6, 3]$,
 $\omega_{OA}=3$, $\alpha=45^\circ$, $\beta=60^\circ$, $OA=24$,
 $AB=12$, $BC=21$, $BD=32$, $DE=4$.

Задача L-30.10.

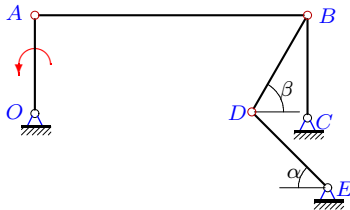
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$\varepsilon_{OA} = [3, 3.3, 3.7, 4.1]$,
 $\omega_{OA}=2$, $\alpha=60^\circ$, $\beta=45^\circ$, $OA=16$,
 $AB=13$, $BC=33$, $BD=47$, $DE=27$.

Задача L-30.11.

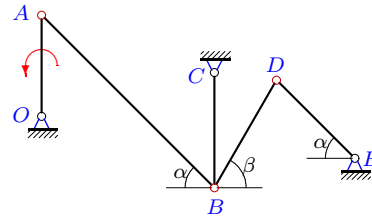
1



$\varepsilon_{OA} = [1, 1.3, 1.6, 2]$,
 $\omega_{OA}=1$, $\alpha=45^\circ$, $\beta=60^\circ$, $OA=22$,
 $AB=61$, $BC=23$, $BD=25$, $DE=24$.

Задача L-30.12.

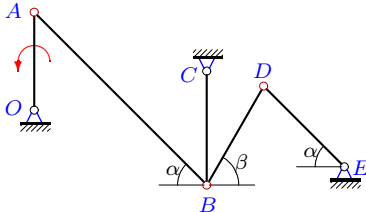
1



$\varepsilon_{OA} = [1, 1.3, 1.7, 2.1]$,
 $\omega_{OA}=3$, $\alpha=45^\circ$, $\beta=60^\circ$, $OA=22$,
 $AB=53$, $BC=25$, $BD=27$, $DE=24$.

Задача L-30.13.

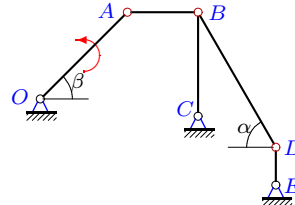
1



$\varepsilon_{OA} = [2, 2.3, 2.7, 3.1]$,
 $\omega_{OA}=4$, $\alpha=45^\circ$, $\beta=60^\circ$, $OA=24$,
 $AB=60$, $BC=28$, $BD=28$, $DE=28$.

Задача L-30.14.

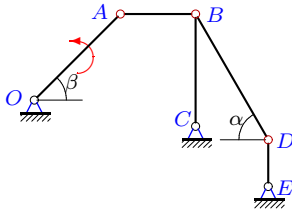
1



$\varepsilon_{OA} = [3, 3.2, 3.6, 4]$,
 $\omega_{OA}=4$, $\alpha=60^\circ$, $\beta=45^\circ$, $OA=26$,
 $AB=15$, $BC=22$, $BD=33$, $DE=8$.

Задача L-30.15.

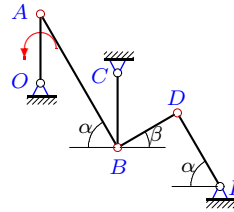
1



$\varepsilon_{OA} = [3, 3.2, 3.6, 4]$,
 $\omega_{OA} = 2$, $\alpha = 60^\circ$, $\beta = 45^\circ$, $OA = 26$,
 $AB = 16$, $BC = 24$, $BD = 31$, $DE = 10$.

Задача L-30.16.

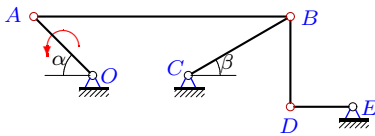
1



$\varepsilon_{OA} = [3, 3.2, 3.6, 4]$,
 $\omega_{OA} = 2$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $OA = 26$,
 $AB = 58$, $BC = 28$, $BD = 26$, $DE = 32$.

Задача L-30.17.

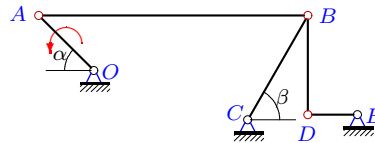
1



$\varepsilon_{OA} = [2, 2.2, 2.5, 2.9]$,
 $\omega_{OA} = 2$, $\alpha = 45^\circ$, $\beta = 30^\circ$, $OA = 24$,
 $AB = 74$, $BC = 34$, $BD = 26$, $DE = 18$.

Задача L-30.18.

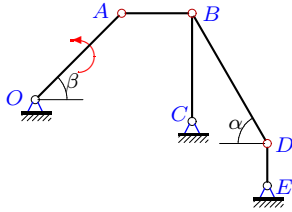
1



$\varepsilon_{OA} = [1, 1.3, 1.6, 2.1]$,
 $\omega_{OA} = 4$, $\alpha = 45^\circ$, $\beta = 60^\circ$, $OA = 22$,
 $AB = 76$, $BC = 34$, $BD = 28$, $DE = 14$.

Задача L-30.19.

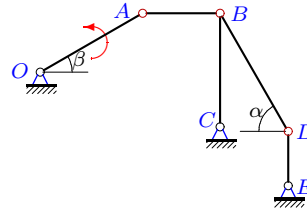
1



$\varepsilon_{OA} = [3, 3.3, 3.7, 4.1]$,
 $\omega_{OA} = 3$, $\alpha = 60^\circ$, $\beta = 45^\circ$, $OA = 26$,
 $AB = 15$, $BC = 23$, $BD = 32$, $DE = 9$.

Задача L-30.20.

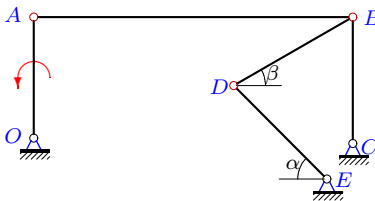
1



$\varepsilon_{OA} = [3, 3.2, 3.6, 4]$,
 $\omega_{OA} = 1$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $OA = 26$,
 $AB = 17$, $BC = 25$, $BD = 30$, $DE = 12$.

Задача L-30.21.

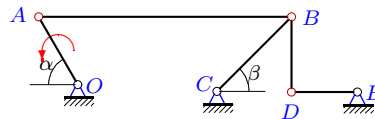
1



$\varepsilon_{OA} = [1, 1.2, 1.5, 2]$,
 $\omega_{OA} = 1$, $\alpha = 45^\circ$, $\beta = 30^\circ$, $OA = 22$,
 $AB = 58$, $BC = 23$, $BD = 25$, $DE = 24$.

Задача L-30.22.

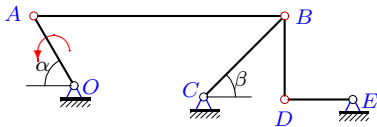
1



$\varepsilon_{OA} = [3, 3.2, 3.5, 3.9]$,
 $\omega_{OA} = 1$, $\alpha = 60^\circ$, $\beta = 45^\circ$, $OA = 26$,
 $AB = 84$, $BC = 35$, $BD = 25$, $DE = 22$.

Задача L-30.23.

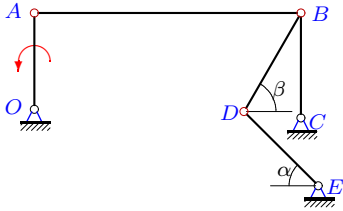
1



$\varepsilon_{OA} = [3, 3.3, 3.7, 4.2]$,
 $\omega_{OA}=3$, $\alpha=60^\circ$, $\beta=45^\circ$, $OA=26$,
 $AB=81$, $BC=37$, $BD=27$, $DE=22$.

Задача L-30.25.

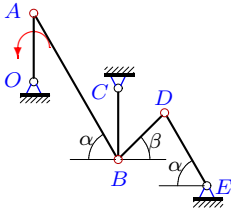
1



$\varepsilon_{OA} = [1, 1.2, 1.6, 2.1]$,
 $\omega_{OA}=2$, $\alpha=45^\circ$, $\beta=60^\circ$, $OA=22$,
 $AB=61$, $BC=24$, $BD=26$, $DE=24$.

Задача L-30.27.

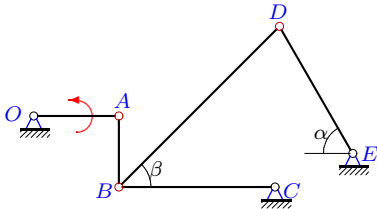
1



$\varepsilon_{OA} = [3, 3.2, 3.5, 3.9]$,
 $\omega_{OA}=1$, $\alpha=60^\circ$, $\beta=45^\circ$, $OA=26$,
 $AB=64$, $BC=27$, $BD=25$, $DE=32$.

Задача L-30.29.

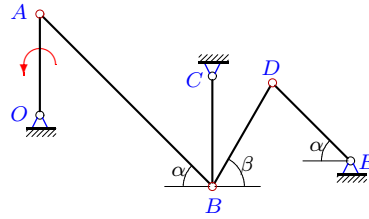
1



$\varepsilon_{OA} = [4, 4.2, 4.5, 4.9]$,
 $\omega_{OA}=3$, $\alpha=60^\circ$, $\beta=45^\circ$, $OA=18$,
 $AB=15$, $BC=33$, $BD=48$, $DE=31$.

Задача L-30.24.

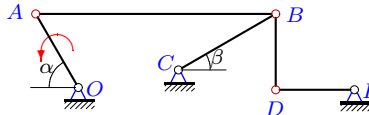
1



$\varepsilon_{OA} = [1, 1.3, 1.6, 2.1]$,
 $\omega_{OA}=2$, $\alpha=45^\circ$, $\beta=60^\circ$, $OA=22$,
 $AB=53$, $BC=24$, $BD=26$, $DE=24$.

Задача L-30.26.

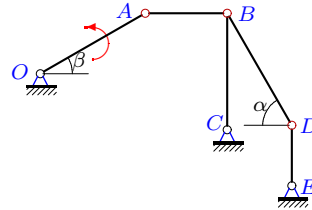
1



$\varepsilon_{OA} = [4, 4.2, 4.6, 5.1]$,
 $\omega_{OA}=1$, $\alpha=60^\circ$, $\beta=30^\circ$, $OA=28$,
 $AB=79$, $BC=37$, $BD=25$, $DE=26$.

Задача L-30.28.

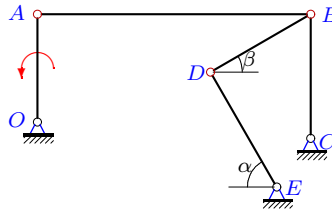
1



$\varepsilon_{OA} = [4, 4.2, 4.6, 5]$,
 $\omega_{OA}=1$, $\alpha=60^\circ$, $\beta=30^\circ$, $OA=28$,
 $AB=19$, $BC=27$, $BD=30$, $DE=14$.

Задача L-30.30.

1



$\varepsilon_{OA} = [3, 3.3, 3.7, 4.2]$,
 $\omega_{OA}=4$, $\alpha=60^\circ$, $\beta=30^\circ$, $OA=26$,
 $AB=66$, $BC=30$, $BD=28$, $DE=32$.

Ответы.

Кинематика плоского механизма

22-Jan-16

| | | | | | | Математическое ожидание | | | | |
|----|---------------|---------------|---------------|---------------|---------------|-------------------------|--------------------|--------------------|--------------------|--------------------|
| | ω_{OA} | ω_{AB} | ω_{BC} | ω_{BD} | ω_{DE} | ε_{OA} | ε_{AB} | ε_{BC} | ε_{BD} | ε_{DE} |
| 1 | 1.000 | 0.693 | 1.287 | 0.901 | -1.773 | 3.400 | 1.645 | 2.825 | 6.750 | -3.497 |
| 2 | 4.000 | 0.000 | -2.250 | -1.273 | -1.161 | 4.490 | 28.125 | -2.526 | -0.629 | -3.270 |
| 3 | 2.000 | 0.000 | -0.941 | -0.610 | -0.868 | 3.440 | 7.843 | -1.619 | -1.066 | -1.839 |
| 4 | 1.000 | -1.149 | 0.735 | 0.000 | 1.532 | 3.430 | -3.637 | 4.103 | -0.976 | 10.662 |
| 5 | 1.000 | 0.000 | -0.500 | -0.301 | -0.296 | 3.480 | 1.714 | -1.740 | -1.013 | -1.133 |
| 6 | 3.000 | 0.000 | -2.710 | -1.556 | 2.021 | 4.400 | 16.258 | 22.823 | 0.357 | -18.367 |
| 7 | 2.000 | 0.000 | -0.824 | -0.436 | -1.091 | 2.490 | 7.906 | -1.025 | -0.736 | -1.795 |
| 8 | 3.000 | 1.268 | 2.582 | 2.502 | -3.070 | 3.440 | -0.069 | -3.012 | 11.223 | 3.827 |
| 9 | 3.000 | -3.000 | 2.969 | 0.000 | 15.588 | 2.400 | -2.240 | 12.661 | -34.775 | 263.185 |
| 10 | 2.000 | 0.000 | -0.970 | -0.610 | -0.868 | 3.480 | 7.310 | -1.687 | -1.068 | -1.881 |
| 11 | 1.000 | 0.000 | 0.957 | 0.644 | 0.475 | 1.430 | 0.016 | 1.368 | 0.640 | 0.957 |
| 12 | 3.000 | 0.000 | -2.640 | -1.789 | 1.424 | 1.480 | 9.933 | 13.587 | 3.479 | -10.649 |
| 13 | 4.000 | 0.000 | -3.429 | -2.510 | 1.775 | 2.480 | 16.809 | 23.344 | 6.910 | -16.945 |
| 14 | 4.000 | -4.903 | 3.343 | 0.000 | 9.192 | 3.400 | -0.945 | 32.600 | -26.072 | 182.787 |
| 15 | 2.000 | -2.298 | 1.532 | -0.000 | 3.677 | 3.400 | -2.831 | 9.189 | -5.088 | 35.715 |
| 16 | 2.000 | 0.000 | -1.857 | -1.000 | 1.407 | 3.400 | 6.916 | 9.250 | -0.673 | -7.706 |
| 17 | 2.000 | 1.253 | 1.997 | 1.305 | -3.266 | 2.350 | -0.142 | -1.716 | 10.777 | 4.111 |
| 18 | 4.000 | 1.291 | 2.113 | 2.222 | -2.566 | 1.440 | 0.505 | -5.966 | -0.270 | 6.760 |
| 19 | 3.000 | -3.677 | 2.398 | 0.000 | 6.128 | 3.480 | -2.052 | 18.793 | -12.859 | 87.621 |
| 20 | 1.000 | -1.325 | 0.520 | 0.000 | 1.083 | 3.400 | -4.136 | 3.862 | -0.488 | 9.102 |
| 21 | 1.000 | 0.000 | 0.957 | 0.644 | 0.822 | 1.360 | 0.016 | 1.301 | 0.820 | 1.305 |
| 22 | 1.000 | 0.423 | 0.910 | 0.901 | -1.023 | 3.350 | 1.221 | 2.302 | 4.020 | -2.580 |
| 23 | 3.000 | 1.315 | 2.582 | 2.502 | -3.070 | 3.490 | 0.012 | -2.777 | 11.450 | 3.549 |
| 24 | 2.000 | 0.000 | -1.833 | -1.239 | 0.949 | 1.440 | 4.501 | 5.708 | 1.136 | -4.488 |
| 25 | 2.000 | 0.000 | 1.833 | 1.239 | 0.949 | 1.410 | 0.120 | 1.293 | -0.126 | 1.720 |
| 26 | 1.000 | 0.709 | 1.311 | 0.970 | -1.615 | 4.410 | 2.387 | 4.194 | 8.019 | -4.850 |
| 27 | 1.000 | 0.000 | -0.963 | -0.538 | 0.595 | 3.350 | 1.595 | 0.048 | -1.262 | -0.463 |
| 28 | 1.000 | -1.276 | 0.519 | -0.000 | 1.000 | 4.400 | -5.261 | 4.326 | -0.449 | 9.177 |
| 29 | 3.000 | 0.000 | -1.636 | -1.009 | -1.275 | 4.350 | 16.691 | -2.373 | -1.324 | -2.741 |
| 30 | 4.000 | 0.000 | 3.467 | 1.857 | 2.815 | 3.490 | 0.840 | 3.025 | -0.477 | 5.071 |

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