

## Движение точки по звену механизма

Плоский шарнирно-стержневой механизм приводится в движение кривошипом  $OA$ , который вращается против часовой стрелки с постоянной угловой скоростью  $\omega$ . Вдоль стержня  $A$  движется точка  $M$  по закону  $AM = \sigma(t)$  или  $BM = \sigma(t)$ . Положение механизма при  $t = t_1$  указано на рисунке. Все размеры даны в см. Стержни, положение которых не задано углом, горизонтальны или вертикальны. Найти абсолютную скорость и абсолютное ускорение точки  $M$  в этот момент.

*Кирсанов М.Н. Решебник. Теоретическая механика с. 209.*

**Вариант 1**  
К12.

$\omega_{OA} = 4.5 \frac{1}{c}$ ,  
 $BM = 14t + 8 \sin^2(\pi t/6)$ ;  $t = 1$  с,  
 $OA=5$ ,  $AB=32$ ,  $BC=21$

**Вариант 2**  
К12.

$\omega_{OA} = 0.7 \frac{1}{c}$ ,  
 $AM = 14(\sin(\pi t/6) + t^2)$ ;  $t = 3$  с,  
 $OA=123$ ,  $AB=350$ ,  $BC=229$

**Вариант 3**  
К12.

$\omega_{OA} = 0.6 \frac{1}{c}$ ,  
 $AM = 12(\sin(\pi t/6) + t^2)$ ;  $t = 5$  с,  
 $OA=201$ ,  $AB=612$ ,  $BC=310$

**Вариант 4**  
К12.

$\omega_{OA} = 2 \frac{1}{c}$ ,  
 $AM = 13t(2 + \cos(\pi t/3))$ ;  $t = 4$  с,  
 $OA=70$ ,  $AB=195$ ,  $BC=130$

**Вариант 5**  
К12.

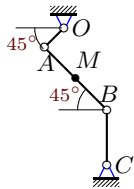
$\omega_{OA} = 1.9 \frac{1}{c}$ ,  
 $AM = 17t(3 - t)$ ;  $t = 1$  с,  
 $OA=20$ ,  $AB=68$ ,  $BC=50$

**Вариант 6**  
К12.

$\omega_{OA} = 1.5 \frac{1}{c}$ ,  
 $AM = 20t + 8 \sin^2(\pi t/4)$ ;  $t = 2$  с,  
 $OA=43$ ,  $AB=120$ ,  $BC=83$

**Вариант 7**

K12.



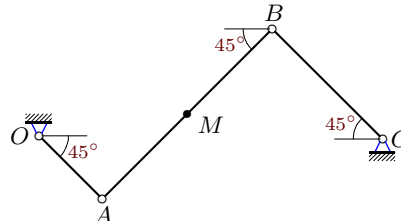
$$\omega_{OA} = 2.8 \frac{1}{c},$$

$$BM = 14t + 8 \sin^2(\pi t/6); t = 1 c,$$

$$OA=10, AB=32, BC=20$$

**Вариант 8**

K12.



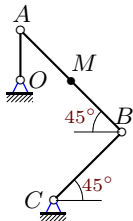
$$\omega_{OA} = 1.5 \frac{1}{c},$$

$$AM = 18t + 8 \sin^2(\pi t/3); t = 3 c,$$

$$OA=40, AB=108, BC=70$$

**Вариант 9**

K12.



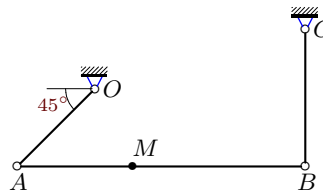
$$\omega_{OA} = 1.5 \frac{1}{c},$$

$$BM = 9t(10 - t); t = 2 c,$$

$$OA=100, AB=288, BC=194$$

**Вариант 10**

K12.



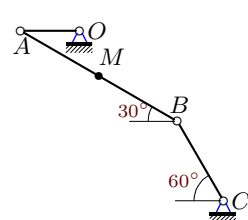
$$\omega_{OA} = 1.9 \frac{1}{c},$$

$$AM = 7t(2 + \cos(\pi t/3)); t = 4 c,$$

$$OA=40, AB=105, BC=50$$

**Вариант 11**

K12.



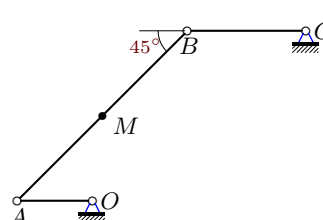
$$\omega_{OA} = 1.3 \frac{1}{c},$$

$$BM = 3t(18 - t); t = 4 c,$$

$$OA=110, AB=336, BC=170$$

**Вариант 12**

K12.



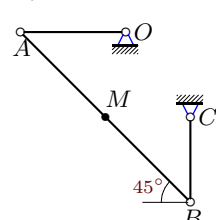
$$\omega_{OA} = 1.3 \frac{1}{c},$$

$$AM = 12t(5 - t); t = 2 c,$$

$$OA=45, AB=144, BC=71$$

**Вариант 13**

K12.



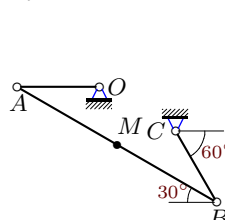
$$\omega_{OA} = 1.1 \frac{1}{c},$$

$$BM = 8t(2 + \cos(\pi t/3)); t = 2 c,$$

$$OA=21, AB=48, BC=17$$

**Вариант 14**

K12.



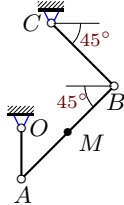
$$\omega_{OA} = 2.6 \frac{1}{c},$$

$$BM = 12t + 8 \sin^2(\pi t/6); t = 1 c,$$

$$OA=10, AB=28, BC=10$$

**Вариант 15**

K12.



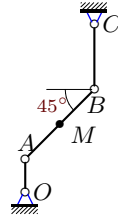
$$\omega_{OA} = 1.6 \frac{1}{c},$$

$$AM = 27t(3 - t); t = 1 \text{ c},$$

$$OA=42, AB=108, BC=73$$

**Вариант 16**

K12.



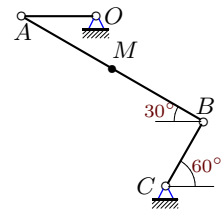
$$\omega_{OA} = 1.2 \frac{1}{c},$$

$$AM = 13t(2 + \cos(\pi t/3)); t = 6 \text{ c},$$

$$OA=159, AB=468, BC=312$$

**Вариант 17**

K12.



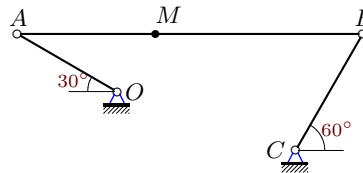
$$\omega_{OA} = 2.6 \frac{1}{c},$$

$$BM = 12t + 8 \sin^2(\pi t/6); t = 1 \text{ c},$$

$$OA=10, AB=28, BC=10$$

**Вариант 18**

K12.



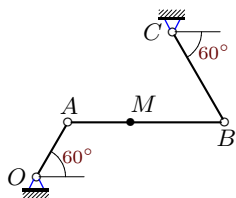
$$\omega_{OA} = 2 \frac{1}{c},$$

$$AM = 12t(2 + \cos(\pi t/3)); t = 4 \text{ c},$$

$$OA=60, AB=180, BC=70$$

**Вариант 19**

K12.



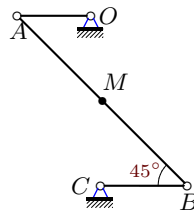
$$\omega_{OA} = 1.5 \frac{1}{c},$$

$$AM = 15t(3 - t); t = 1 \text{ c},$$

$$OA=30, AB=75, BC=50$$

**Вариант 20**

K12.



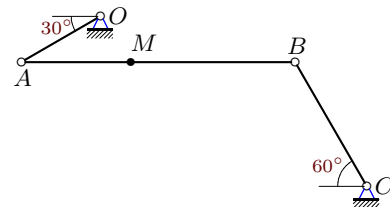
$$\omega_{OA} = 2.7 \frac{1}{c},$$

$$BM = 12(\sin(\pi t/6) + t^2); t = 1 \text{ c},$$

$$OA=11, AB=36, BC=13$$

**Вариант 21**

K12.



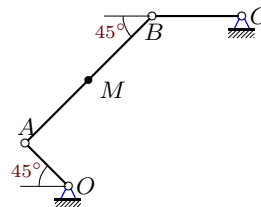
$$\omega_{OA} = 2 \frac{1}{c},$$

$$AM = 14t(2 + \cos(\pi t/3)); t = 4 \text{ c},$$

$$OA=70, AB=210, BC=110$$

**Вариант 22**

K12.



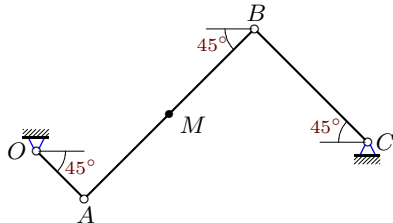
$$\omega_{OA} = 0.6 \frac{1}{c},$$

$$AM = 11(\sin(\pi t/6) + t^2); t = 5 \text{ c},$$

$$OA=190, AB=561, BC=280$$

**Вариант 23**

K12.



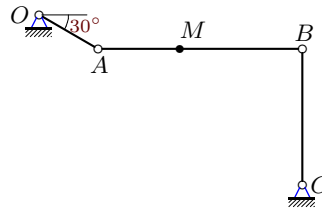
$$\omega_{OA} = 1.6 \frac{1}{c},$$

$$AM = 16t + 8 \sin^2(\pi t/3); t = 3 \text{ c},$$

$$OA=27, AB=96, BC=64$$

**Вариант 24**

K12.



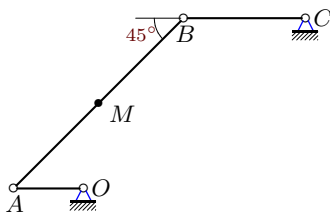
$$\omega_{OA} = 1.2 \frac{1}{c},$$

$$AM = 12t(5 - t); t = 2 \text{ c},$$

$$OA=60, AB=180, BC=120$$

**Вариант 25**

K12.



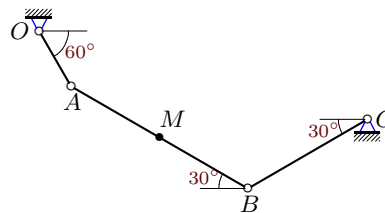
$$\omega_{OA} = 1.6 \frac{1}{c},$$

$$AM = 20t + 8 \sin^2(\pi t/3); t = 3 \text{ c},$$

$$OA=35, AB=120, BC=61$$

**Вариант 26**

K12.



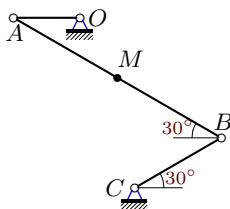
$$\omega_{OA} = 1.6 \frac{1}{c},$$

$$BM = 6t(10 - t); t = 2 \text{ c},$$

$$OA=60, AB=192, BC=130$$

**Вариант 27**

K12.



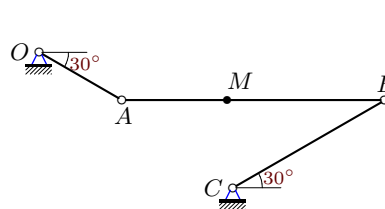
$$\omega_{OA} = 1.2 \frac{1}{c},$$

$$BM = 12t(2 + \cos(\pi t/3)); t = 2 \text{ c},$$

$$OA=20, AB=72, BC=30$$

**Вариант 28**

K12.



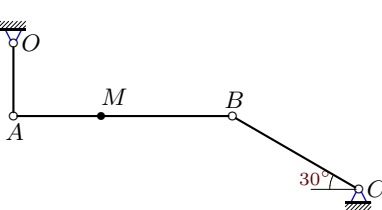
$$\omega_{OA} = 1.9 \frac{1}{c},$$

$$AM = 11t(2 + \cos(\pi t/3)); t = 4 \text{ c},$$

$$OA=60, AB=165, BC=110$$

**Вариант 29**

K12.



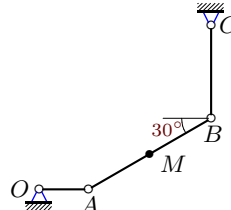
$$\omega_{OA} = 1.2 \frac{1}{c},$$

$$AM = 10t(5 - t); t = 2 \text{ c},$$

$$OA=50, AB=150, BC=100$$

**Вариант 30**

K12.



$$\omega_{OA} = 1.2 \frac{1}{c},$$

$$AM = 8t(2 + \cos(\pi t/3)); t = 6 \text{ c},$$

$$OA=100, AB=288, BC=190$$

Ответы

	$\omega_e$	$\varepsilon_e$	$v_r^T$	$v_e$	$v$	$W_r^T$	$W_e$	$W_C$	$W$
1	0.00	-3.41	-17.63	22.50	16.00	-2.19	73.60	0.00	71.46
2	-0.17	0.10	84.00	71.00	43.23	24.16	55.07	29.22	62.43
3	0.14	0.05	114.56	95.34	51.72	22.36	58.63	31.93	67.79
4	-0.62	0.62	66.66	100.96	72.82	52.09	287.75	82.89	281.49
5	0.00	-2.97	17.00	38.00	48.77	-34.00	90.18	0.00	116.36
6	-0.00	0.55	20.00	64.50	52.31	-9.87	80.30	0.00	88.85
7	0.88	-6.22	-17.63	31.30	17.42	-2.19	24.43	30.85	53.95
8	0.00	-1.31	18.00	60.00	78.00	17.55	19.29	0.00	26.07
9	0.37	0.35	-54.00	118.59	168.62	18.00	176.81	39.77	216.39
10	0.51	-0.42	35.89	62.67	95.26	28.05	124.17	36.74	169.90
11	0.74	-1.10	-30.00	71.50	41.50	6.00	115.83	44.23	156.29
12	0.00	0.27	12.00	58.50	50.73	-24.00	63.67	0.00	45.26
13	0.68	0.46	2.51	16.33	18.84	5.74	29.84	3.42	34.82
14	1.61	2.76	-15.63	13.00	2.63	-2.19	75.84	50.27	29.98
15	0.44	-0.42	27.00	53.13	78.21	-54.00	84.62	23.76	78.10
16	0.00	1.04	39.00	190.80	165.54	-85.54	181.71	0.00	260.83
17	0.80	-1.81	-15.63	17.20	11.56	-2.19	50.21	25.13	50.15
18	0.77	-0.10	61.53	77.15	48.52	48.08	208.38	94.73	215.70
19	-0.60	0.94	15.00	39.23	24.39	-30.00	53.93	18.00	88.88
20	0.00	-5.82	-29.44	29.70	22.63	-22.36	74.28	0.00	59.01
21	0.77	-0.67	71.79	90.01	152.66	56.10	210.15	110.52	315.72
22	-0.20	-0.15	105.01	127.46	57.70	20.49	112.02	42.68	154.36
23	0.00	-1.02	16.00	43.20	59.20	17.55	19.98	0.00	26.59
24	-0.35	-0.31	12.00	51.92	60.86	-24.00	86.12	8.31	108.24
25	0.00	0.45	20.00	56.00	44.18	17.55	73.04	0.00	88.69
26	-0.58	0.33	-36.00	55.43	30.20	12.00	197.73	41.57	214.62
27	0.19	-0.48	3.77	18.33	20.99	8.61	23.79	1.45	32.25
28	-1.20	2.36	56.40	60.32	115.11	44.08	386.45	135.00	270.79
29	0.69	-3.23	10.00	72.99	81.41	-20.00	125.24	13.86	118.54
30	-0.48	0.23	24.00	69.28	90.86	-52.64	190.20	23.09	226.34