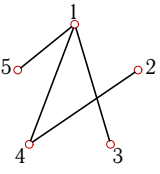
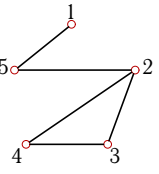
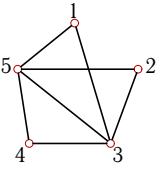
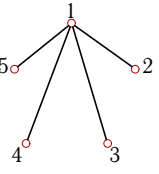
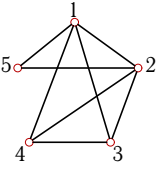
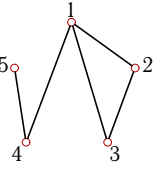
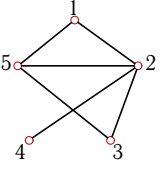
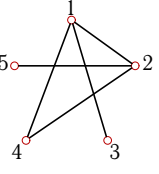


Размещение вершин графа на линейке

Найти наилучшее размещение графа на линейке после трех циклов генетического алгоритма. Качество размещения оценивается суммой¹

$$L = \sum_i^5 \sum_j^5 d_{ij} a_{ij},$$

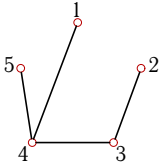
где d_{ij} — расстояние (в ребрах) по линейке между вершинами v_i и v_j , a_{ij} — соответствующий элемент матрицы смежности (0 или 1). На каждом этапе $k = 1, 2, 3$ эволюции на хромосому $h_i = [v_1, v_2, \dots, v_5]$ с лучшим качеством действует оператор мутации R_k инверсионного типа, генерирующий хромосому $h'_i = [v_1, v_2, \dots, v_k, v_5, \dots, v_{k+1}]$. Хромосома с худшим качеством удаляется из популяции. Найти $\min L$. При равных качествах хромосом предпочтение отдается хромосоме с меньшим номером.

<p>Задача 15.1. 2</p>  <div style="margin-left: 100px;"> <p>1) <table border="1" style="display: inline-table;"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table></p> <p>2) <table border="1" style="display: inline-table;"><tr><td>2</td><td>1</td><td>3</td><td>4</td><td>5</td></tr></table></p> <p>3) <table border="1" style="display: inline-table;"><tr><td>5</td><td>2</td><td>3</td><td>4</td><td>1</td></tr></table></p> </div>	1	2	3	4	5	2	1	3	4	5	5	2	3	4	1	<p>Задача 15.2. 2</p>  <div style="margin-left: 100px;"> <p>1) <table border="1" style="display: inline-table;"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table></p> <p>2) <table border="1" style="display: inline-table;"><tr><td>1</td><td>3</td><td>2</td><td>4</td><td>5</td></tr></table></p> <p>3) <table border="1" style="display: inline-table;"><tr><td>5</td><td>2</td><td>3</td><td>4</td><td>1</td></tr></table></p> </div>	1	2	3	4	5	1	3	2	4	5	5	2	3	4	1
1	2	3	4	5																											
2	1	3	4	5																											
5	2	3	4	1																											
1	2	3	4	5																											
1	3	2	4	5																											
5	2	3	4	1																											
<p>Задача 15.3. 2</p>  <div style="margin-left: 100px;"> <p>1) <table border="1" style="display: inline-table;"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table></p> <p>2) <table border="1" style="display: inline-table;"><tr><td>2</td><td>1</td><td>3</td><td>4</td><td>5</td></tr></table></p> <p>3) <table border="1" style="display: inline-table;"><tr><td>5</td><td>2</td><td>3</td><td>4</td><td>1</td></tr></table></p> </div>	1	2	3	4	5	2	1	3	4	5	5	2	3	4	1	<p>Задача 15.4. 2</p>  <div style="margin-left: 100px;"> <p>1) <table border="1" style="display: inline-table;"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table></p> <p>2) <table border="1" style="display: inline-table;"><tr><td>2</td><td>1</td><td>3</td><td>4</td><td>5</td></tr></table></p> <p>3) <table border="1" style="display: inline-table;"><tr><td>5</td><td>2</td><td>3</td><td>4</td><td>1</td></tr></table></p> </div>	1	2	3	4	5	2	1	3	4	5	5	2	3	4	1
1	2	3	4	5																											
2	1	3	4	5																											
5	2	3	4	1																											
1	2	3	4	5																											
2	1	3	4	5																											
5	2	3	4	1																											
<p>Задача 15.5. 2</p>  <div style="margin-left: 100px;"> <p>1) <table border="1" style="display: inline-table;"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table></p> <p>2) <table border="1" style="display: inline-table;"><tr><td>2</td><td>1</td><td>3</td><td>4</td><td>5</td></tr></table></p> <p>3) <table border="1" style="display: inline-table;"><tr><td>5</td><td>2</td><td>3</td><td>4</td><td>1</td></tr></table></p> </div>	1	2	3	4	5	2	1	3	4	5	5	2	3	4	1	<p>Задача 15.6. 2</p>  <div style="margin-left: 100px;"> <p>1) <table border="1" style="display: inline-table;"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table></p> <p>2) <table border="1" style="display: inline-table;"><tr><td>2</td><td>1</td><td>3</td><td>4</td><td>5</td></tr></table></p> <p>3) <table border="1" style="display: inline-table;"><tr><td>1</td><td>5</td><td>3</td><td>4</td><td>2</td></tr></table></p> </div>	1	2	3	4	5	2	1	3	4	5	1	5	3	4	2
1	2	3	4	5																											
2	1	3	4	5																											
5	2	3	4	1																											
1	2	3	4	5																											
2	1	3	4	5																											
1	5	3	4	2																											
<p>Задача 15.7. 2</p>  <div style="margin-left: 100px;"> <p>1) <table border="1" style="display: inline-table;"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table></p> <p>2) <table border="1" style="display: inline-table;"><tr><td>2</td><td>1</td><td>3</td><td>4</td><td>5</td></tr></table></p> <p>3) <table border="1" style="display: inline-table;"><tr><td>5</td><td>2</td><td>3</td><td>4</td><td>1</td></tr></table></p> </div>	1	2	3	4	5	2	1	3	4	5	5	2	3	4	1	<p>Задача 15.8. 2</p>  <div style="margin-left: 100px;"> <p>1) <table border="1" style="display: inline-table;"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table></p> <p>2) <table border="1" style="display: inline-table;"><tr><td>1</td><td>3</td><td>2</td><td>4</td><td>5</td></tr></table></p> <p>3) <table border="1" style="display: inline-table;"><tr><td>5</td><td>2</td><td>3</td><td>4</td><td>1</td></tr></table></p> </div>	1	2	3	4	5	1	3	2	4	5	5	2	3	4	1
1	2	3	4	5																											
2	1	3	4	5																											
5	2	3	4	1																											
1	2	3	4	5																											
1	3	2	4	5																											
5	2	3	4	1																											

¹Емельянов В.В., Курейчик В.М., Курейчик В.В. Теория и практика эволюционного моделирования. — М.: ФИЗМАТЛИТ, 2003

Задача 15.9.

2



- 1)

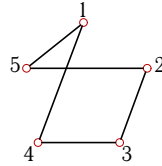
1	2	3	4	5
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- 2)

2	1	3	4	5
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- 3)

5	2	3	4	1
---	---	---	---	---

Задача 15.10.

2



- 1)

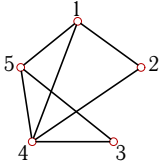
1	2	3	4	5
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- 2)

2	1	3	4	5
---	---	---	---	---
- 3)

5	2	3	4	1
---	---	---	---	---

Задача 15.11.

2



- 1)

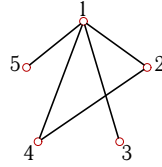
1	2	3	4	5
---	---	---	---	---
- 2)

2	1	3	4	5
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- 3)

5	2	3	4	1
---	---	---	---	---

Задача 15.12.

2



- 1)

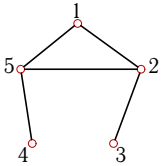
1	2	3	4	5
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- 2)

2	1	3	4	5
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- 3)

1	5	3	4	2
---	---	---	---	---

Задача 15.13.

2



- 1)

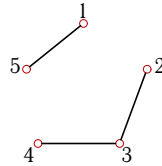
1	2	3	4	5
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- 2)

2	1	3	4	5
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- 3)

1	5	3	4	2
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Задача 15.14.

2



- 1)

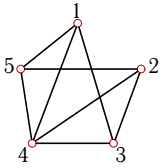
1	2	3	4	5
---	---	---	---	---
- 2)

1	3	2	4	5
---	---	---	---	---
- 3)

1	5	3	4	2
---	---	---	---	---

Задача 15.15.

2



- 1)

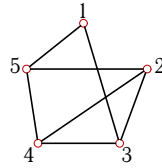
1	2	3	4	5
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- 2)

2	1	3	4	5
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- 3)

1	5	3	4	2
---	---	---	---	---

Задача 15.16.

2



- 1)

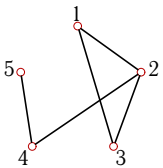
1	2	3	4	5
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- 2)

2	1	3	4	5
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- 3)

5	2	3	4	1
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Задача 15.17.

2



- 1)

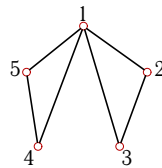
1	2	3	4	5
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- 2)

2	1	3	4	5
---	---	---	---	---
- 3)

5	2	3	4	1
---	---	---	---	---

Задача 15.18.

2



- 1)

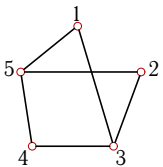
1	2	3	4	5
---	---	---	---	---
- 2)

2	1	3	4	5
---	---	---	---	---
- 3)

5	2	3	4	1
---	---	---	---	---

Задача 15.19.

2



- 1)

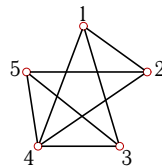
1	2	3	4	5
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- 2)

2	1	3	4	5
---	---	---	---	---
- 3)

5	2	3	4	1
---	---	---	---	---

Задача 15.20.

2



- 1)

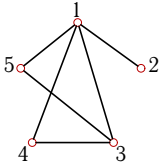
1	2	3	4	5
---	---	---	---	---
- 2)

1	3	2	4	5
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- 3)

5	2	3	4	1
---	---	---	---	---

Задача 15.21.

2



- 1)

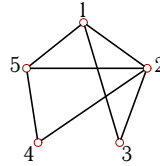
1	2	3	4	5
---	---	---	---	---
- 2)

2	1	3	4	5
---	---	---	---	---
- 3)

1	5	3	4	2
---	---	---	---	---

Задача 15.22.

2



- 1)

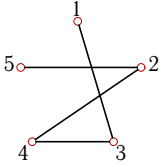
1	2	3	4	5
---	---	---	---	---
- 2)

2	1	3	4	5
---	---	---	---	---
- 3)

1	5	3	4	2
---	---	---	---	---

Задача 15.23.

2



- 1)

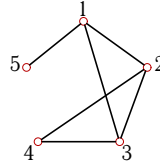
1	2	3	4	5
---	---	---	---	---
- 2)

2	1	3	4	5
---	---	---	---	---
- 3)

1	5	3	4	2
---	---	---	---	---

Задача 15.24.

2



- 1)

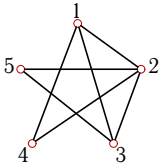
1	2	3	4	5
---	---	---	---	---
- 2)

2	1	3	4	5
---	---	---	---	---
- 3)

1	5	3	4	2
---	---	---	---	---

Задача 15.25.

2



- 1)

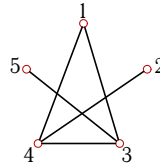
1	2	3	4	5
---	---	---	---	---
- 2)

2	1	3	4	5
---	---	---	---	---
- 3)

1	5	3	4	2
---	---	---	---	---

Задача 15.26.

2



- 1)

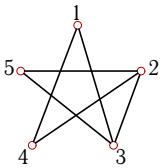
1	2	3	4	5
---	---	---	---	---
- 2)

1	3	2	4	5
---	---	---	---	---
- 3)

5	2	3	4	1
---	---	---	---	---

Задача 15.27.

2



- 1)

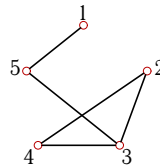
1	2	3	4	5
---	---	---	---	---
- 2)

2	1	3	4	5
---	---	---	---	---
- 3)

1	5	3	4	2
---	---	---	---	---

Задача 15.28.

2



- 1)

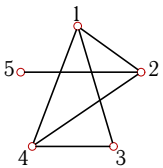
1	2	3	4	5
---	---	---	---	---
- 2)

2	1	3	4	5
---	---	---	---	---
- 3)

1	5	3	4	2
---	---	---	---	---

Задача 15.29.

2



- 1)

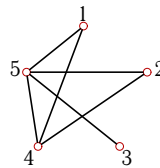
1	2	3	4	5
---	---	---	---	---
- 2)

2	1	3	4	5
---	---	---	---	---
- 3)

5	2	3	4	1
---	---	---	---	---

Задача 15.30.

2



- 1)

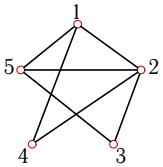
1	2	3	4	5
---	---	---	---	---
- 2)

2	1	3	4	5
---	---	---	---	---
- 3)

1	5	3	4	2
---	---	---	---	---

Задача 15.31.

2



- 1)

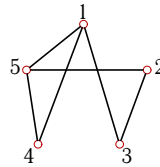
1	2	3	4	5
---	---	---	---	---
- 2)

2	1	3	4	5
---	---	---	---	---
- 3)

5	2	3	4	1
---	---	---	---	---

Задача 15.32.

2



- 1)

1	2	3	4	5
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- 2)

2	1	3	4	5
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- 3)

1	5	3	4	2
---	---	---	---	---

Размещение вершин графа на линейке

	0	1	2	3	min L	seq
1	29	26	25	22	6	2 -5 -4 -1 -3
2	30	28	25	23	7	5 -1 -2 -3 -4
3	42	40	38	38	12	1 -5 -2 -3 -4
4	27	27	24	21	7	2 -1 -3 -4 -5
5	49	47	43	41	13	5 -1 -2 -3 -4
6	28	26	26	23	7	2 -1 -3 -4 -5
7	41	39	37	34	10	1 -2 -5 -3 -4
8	29	29	29	28	9	1 -3 -2 -4 -5
9	18	17	17	17	5	1 -5 -4 -3 -2
10	32	28	24	24	8	5 -1 -2 -3 -4
11	43	42	38	37	11	2 -1 -5 -4 -3
12	33	33	31	31	10	2 -1 -5 -4 -3
13	33	31	28	26	8	1 -2 -5 -4 -3
14	17	17	14	11	3	1 -5 -2 -3 -4
15	49	49	47	46	15	1 -5 -2 -4 -3
16	43	40	38	36	12	1 -5 -4 -3 -2
17	26	26	26	23	7	1 -2 -3 -4 -5
18	36	36	34	32	10	2 -1 -3 -4 -5
19	36	34	32	31	10	1 -5 -2 -3 -4
20	45	45	45	45	15	1 -2 -3 -4 -5
21	35	35	32	29	9	2 -1 -5 -3 -4
22	44	44	43	41	13	1 -2 -3 -5 -4
23	24	23	22	21	7	1 -5 -2 -4 -3
24	33	33	33	33	11	1 -2 -3 -4 -5
25	45	45	45	43	14	1 -2 -3 -4 -5
26	28	27	27	26	8	5 -2 -3 -4 -1
27	39	37	37	37	12	1 -2 -4 -3 -5
28	27	25	23	20	6	1 -5 -3 -4 -2
29	34	34	30	27	8	5 -2 -1 -4 -3
30	41	39	35	35	11	1 -5 -2 -4 -3
31	47	45	43	42	14	5 -2 -1 -4 -3
32	40	37	35	32	10	2 -5 -4 -1 -3