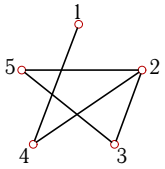
Размещение вершин графа на линейке

Найти наилучшее размещение графа на линейке после трех циклов генетического алгоритма. Качество размещения оценивается суммой[1]

$$L = \sum_{i}^{5} \sum_{j}^{5} d_{ij} a_{ij},$$

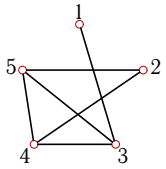
где d_{ij} — расстояние (в ребрах) по линейке между вершинами v_i и v_j, a_{ij} — соответствующий элемент матрицы смежности (0 или 1). На каждом этапе $k = 1, 2, 3$ эволюции на хромосому $h_i = [v_1, v_2, ..., v_5]$ с лучшим качеством действует оператор мутации R_k инверсионного типа, генерирующий хромосому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

Задача 15.1. *3*



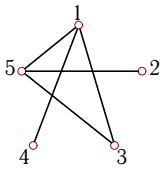
1)	1	2	3	4	5
2)	2	1	3	4	5
3)	5	2	3	4	1

Задача 15.2. *3*



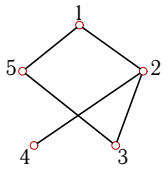
1)	1	2	3	4	5
2)	2	1	3	4	5
3)	5	2	3	4	1

Задача 15.3. *3*



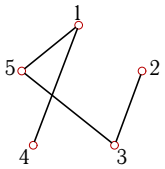
1)	1	2	3	4	5
2)	2	1	3	4	5
3)	5	2	3	4	1

Задача 15.4. *3*



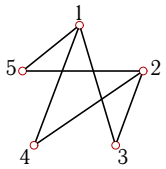
1)	1	2	3	4	5
2)	1	3	2	4	5
3)	1	5	3	4	2

Задача 15.5. *3*



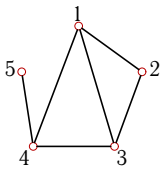
1)	1	2	3	4	5
2)	2	1	3	4	5
3)	5	2	3	4	1

Задача 15.6. *3*



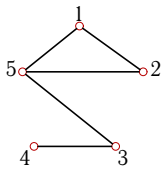
1)	1	2	3	4	5
2)	2	1	3	4	5
3)	5	2	3	4	1

Задача 15.7. *3*



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

Задача 15.8. *3*

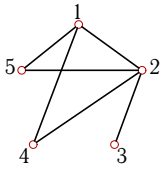


1)	1	2	3	4	5
2)	1	3	2	4	5
3)	1	5	3	4	2

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

Задача 15.9.

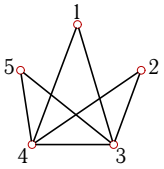
3



1) | 1 | 2 | 3 | 4 | 5 |
2) | 2 | 1 | 3 | 4 | 5 |
3) | 5 | 2 | 3 | 4 | 1 |

Задача 15.10.

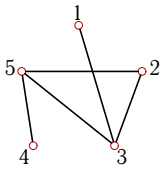
3



1) | 1 | 2 | 3 | 4 | 5 |
2) | 2 | 1 | 3 | 4 | 5 |
3) | 1 | 5 | 3 | 4 | 2 |

Задача 15.11.

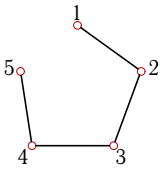
3



1) | 1 | 2 | 3 | 4 | 5 |
2) | 2 | 1 | 3 | 4 | 5 |
3) | 1 | 5 | 3 | 4 | 2 |

Задача 15.12.

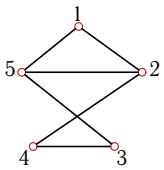
3



1) | 1 | 2 | 3 | 4 | 5 |
2) | 2 | 1 | 3 | 4 | 5 |
3) | 5 | 2 | 3 | 4 | 1 |

Задача 15.13.

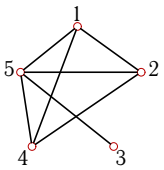
3



1) | 1 | 2 | 3 | 4 | 5 |
2) | 1 | 3 | 2 | 4 | 5 |
3) | 5 | 2 | 3 | 4 | 1 |

Задача 15.14.

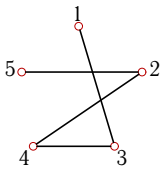
3



1) | 1 | 2 | 3 | 4 | 5 |
2) | 2 | 1 | 3 | 4 | 5 |
3) | 5 | 2 | 3 | 4 | 1 |

Задача 15.15.

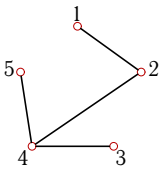
3



1) | 1 | 2 | 3 | 4 | 5 |
2) | 2 | 1 | 3 | 4 | 5 |
3) | 5 | 2 | 3 | 4 | 1 |

Задача 15.16.

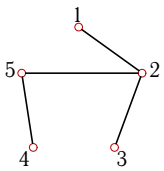
3



1) | 1 | 2 | 3 | 4 | 5 |
2) | 2 | 1 | 3 | 4 | 5 |
3) | 1 | 5 | 3 | 4 | 2 |

Задача 15.17.

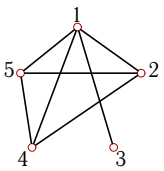
3



1) | 1 | 2 | 3 | 4 | 5 |
2) | 2 | 1 | 3 | 4 | 5 |
3) | 1 | 5 | 3 | 4 | 2 |

Задача 15.18.

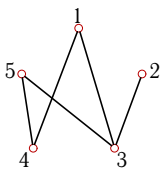
3



1) | 1 | 2 | 3 | 4 | 5 |
2) | 2 | 1 | 3 | 4 | 5 |
3) | 1 | 5 | 3 | 4 | 2 |

Задача 15.19.

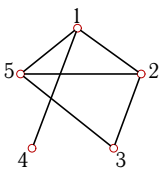
3



1) | 1 | 2 | 3 | 4 | 5 |
2) | 2 | 1 | 3 | 4 | 5 |
3) | 1 | 5 | 3 | 4 | 2 |

Задача 15.20.

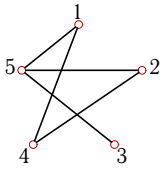
3



1) | 1 | 2 | 3 | 4 | 5 |
2) | 2 | 1 | 3 | 4 | 5 |
3) | 5 | 2 | 3 | 4 | 1 |

Задача 15.21.

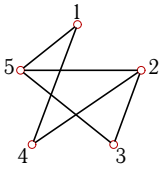
3



1) | 1 | 2 | 3 | 4 | 5 |
2) | 2 | 1 | 3 | 4 | 5 |
3) | 1 | 5 | 3 | 4 | 2 |

Задача 15.22.

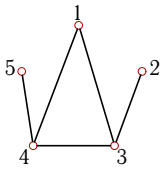
3



1) | 1 | 2 | 3 | 4 | 5 |
2) | 2 | 1 | 3 | 4 | 5 |
3) | 5 | 2 | 3 | 4 | 1 |

Задача 15.23.

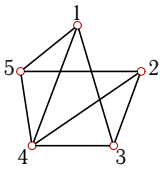
3



1) | 1 | 2 | 3 | 4 | 5 |
2) | 1 | 3 | 2 | 4 | 5 |
3) | 5 | 2 | 3 | 4 | 1 |

Задача 15.24.

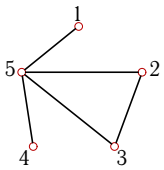
3



1) | 1 | 2 | 3 | 4 | 5 |
2) | 2 | 1 | 3 | 4 | 5 |
3) | 5 | 2 | 3 | 4 | 1 |

Задача 15.25.

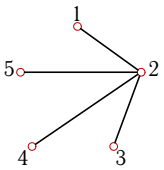
3



1) | 1 | 2 | 3 | 4 | 5 |
2) | 1 | 3 | 2 | 4 | 5 |
3) | 5 | 2 | 3 | 4 | 1 |

Задача 15.26.

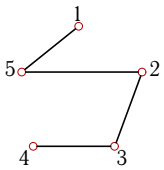
3



1) | 1 | 2 | 3 | 4 | 5 |
2) | 2 | 1 | 3 | 4 | 5 |
3) | 1 | 5 | 3 | 4 | 2 |

Задача 15.27.

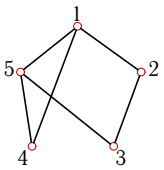
3



1) | 1 | 2 | 3 | 4 | 5 |
2) | 1 | 3 | 2 | 4 | 5 |
3) | 1 | 5 | 3 | 4 | 2 |

Задача 15.28.

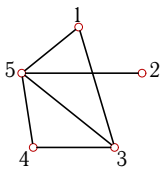
3



1) | 1 | 2 | 3 | 4 | 5 |
2) | 2 | 1 | 3 | 4 | 5 |
3) | 5 | 2 | 3 | 4 | 1 |

Задача 15.29.

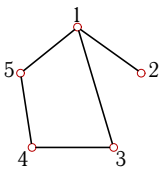
3



1) | 1 | 2 | 3 | 4 | 5 |
2) | 2 | 1 | 3 | 4 | 5 |
3) | 5 | 2 | 3 | 4 | 1 |

Задача 15.30.

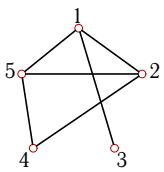
3



1) | 1 | 2 | 3 | 4 | 5 |
2) | 2 | 1 | 3 | 4 | 5 |
3) | 5 | 2 | 3 | 4 | 1 |

Задача 15.31.

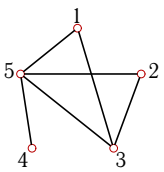
3



1) | 1 | 2 | 3 | 4 | 5 |
2) | 2 | 1 | 3 | 4 | 5 |
3) | 5 | 2 | 3 | 4 | 1 |

Задача 15.32.

3



1) | 1 | 2 | 3 | 4 | 5 |
2) | 2 | 1 | 3 | 4 | 5 |
3) | 1 | 5 | 3 | 4 | 2 |

15.3

Размещение вершин графа на линейке

	0	1	2	3	min L	seq
1	31	29	29	26	7	5 -2 -3 -4 -1
2	34	34	33	33	11	1 -2 -3 -4 -5
3	36	33	31	29	9	5 -2 -1 -3 -4
4	30	28	27	27	9	1 -2 -5 -3 -4
5	27	23	22	21	6	5 -1 -4 -3 -2
6	41	37	33	33	11	5 -1 -2 -3 -4
7	33	31	31	30	9	1 -2 -3 -4 -5
8	34	31	26	23	6	1 -2 -5 -3 -4
9	41	38	34	31	9	5 -1 -2 -4 -3
10	36	36	36	36	12	1 -2 -3 -4 -5
11	29	29	29	26	7	1 -2 -3 -5 -4
12	17	16	15	14	4	1 -2 -3 -4 -5
13	40	39	35	31	9	1 -2 -5 -4 -3
14	48	47	46	43	13	1 -5 -2 -4 -3
15	23	23	20	18	6	5 -2 -1 -4 -3
16	19	19	16	16	5	1 -2 -3 -4 -5
17	25	23	20	17	5	1 -2 -3 -5 -4
18	47	45	43	40	12	2 -5 -1 -4 -3
19	27	26	26	25	8	2 -1 -3 -4 -5
20	40	39	37	35	11	5 -2 -1 -3 -4
21	37	34	29	28	9	1 -5 -2 -4 -3
22	42	38	36	34	11	5 -2 -3 -4 -1
23	24	24	24	24	8	1 -2 -3 -4 -5
24	49	46	45	43	14	5 -1 -4 -3 -2
25	33	30	27	25	8	1 -5 -2 -3 -4
26	27	27	24	21	7	1 -2 -3 -4 -5
27	25	25	21	16	4	1 -5 -2 -3 -4
28	37	37	34	32	10	2 -1 -3 -5 -4
29	38	34	30	28	9	2 -5 -1 -3 -4
30	29	26	23	21	7	2 -1 -3 -4 -5
31	41	40	37	36	11	1 -2 -5 -4 -3
32	37	37	37	34	10	1 -5 -3 -2 -4