**Системный анализ и синтез сложных систем**

**Часть 4 (8 семестр)**

*Курсовой проект на тему:* ***«Исследование систем методами дискретной математики»***

Структура курсового проекта:

Титульный лист

Содержание

Задание (*свой вариант*)

Введение (*1-2 стр.*)

1. Теоретическая часть (*20-25 стр.*). *Название своего теоретического вопроса*

1.1. …

1.2. …

…

2. Расчетно-практическая часть

2.1. Нахождение кратчайших путей на графе (*задание 1*)

2.2. Нахождение максимального потока на графе (*задание 2*)

2.3. Нормальные формы булевой алгебры (*задание 3*)

Заключение

Литература (*не менее 15 ссылок*)

Графическая часть (*с рамкой*)

**Темы теоретических вопросов**

1. Теория множеств и ее приложения

2. Отношения и соответствия на множествах

3. Линейные и абелевы группы

4. Графы и способы их определения

5. Эйлеровы и гамильтоновы графы

6. Связность графа, циклы на графах

7. Деревья и их приложения.

8. Раскраски графов

9. Задача паросочетаний на графе

10. Алгоритмы на графах.

11. Нахождение наименьшего остовного дерева и наименьшего пути на графе.

12. Нахождение максимального потока на графе.

13. Задача коммивояжера.

14. Сетевое планирование и управление.

15. Производящие функции в теории графов

16. Графы на двумерных поверхностях

17. Алгоритмы поиска на графе

18. Комбинаторика.

19. Логика высказываний

20. Методы решения логических задач

21. Булева алгебра

22. Нормальные формы булевой алгебры

23. Методы минимизации булевых форм

24. Алгебра Жегалкина

25. Алгебра предикатов, кванторы

26. Нечеткая логика

27. Нечеткие множества

28. Теория алгоритмов

29. Машины Тьюринга.

30. Приложения булевых алгебр к переключательным схемам

**Задания на расчетно-практическую часть**

**Задание 1.** Имеется 18 населенных пунктов. Расстояние между населенными пунктами, соединенными дорогами, приведено в таблице из приложения 1 (по вариантам).

а) построить граф, вершинами которого будут населенные пункты, а ребрами – дороги, их соединяющие с указанием расстояний. Дороги не должны пересекаться. Граф изобразить в графической части на первом листе.

б) Найти кратчайшие пути из вершины «0» до всех остальных вершин. Вывести результат в виде таблицы путей и расстояний.

**Задание 2.** Имеется 12 узлов, в которых происходит перераспределение некоторого потока. Узел «1» является источником, а узел «12» - стоком. Ребра позволяют проводить поток между узлами, их пропускные способности приведены в таблице из приложения 2 (по вариантам).

а) построить граф, вершинами которого будут узлы, а ребрами – каналы потока, их соединяющие с указанием пропускных способностей. Ребра не должны пересекаться. Граф изобразить в графической части на втором листе.

б) Найти максимальный поток в сети аналитически. Результат найденными потоками и направлениями изобразить на втором листе графической части.

в) Найти максимальный поток в сети с помощью решения оптимизационной задачи в Excel. Необходимо привести задачу линейного программирования, решаемую при нахождении потока. Результат выдать в виде матрицы смежности с приведенными потоками. Привести изображение расчета в Excel.

**Задание 3.** Дана логическая функция 4 переменных , которая задана таблично (приложение 3 по вариантам). Необходимо:

а) Построить СДНФ логической функции, минимизировать ее до ДНФ.

б) Построить СКНФ логической функции, минимизировать ее до КНФ.

в) Построить полином Жегалкина.

Приложение 1

Матрица расстояний для графа из задания № 1

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| **Вариант 1** (выше диагонали), **Вариант 2** (ниже диагонали) | | | | | | | | | | | | | | | | | | |
|  | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** |
| **0** | **0** | 35 | 68 | 39 | 89 | - | - | - | - | 54 | - | - | - | - | - | - | - | - |
| **1** | 53 | **0** | 12 | - | - | 18 | 7 | - | - | - | 20 | - | - | - | - | - | - | - |
| **2** | 27 | 72 | **0** | 19 | - | - | 81 | 94 | - | - | - | - | - | - | - | - | - | - |
| **3** | 55 | - | 59 | **0** | 30 | - | - | 52 | 73 | - | - | - | - | - | - | - | - | - |
| **4** | 46 | - | - | 64 | **0** | - | - | - | 27 | 26 | - | - | - | - | - | - | - | - |
| **5** | - | 66 | - | - | - | **0** | 30 | - | - | - | 24 | - | - | - | - | - | - | - |
| **6** | - | 58 | 70 | - | - | 63 | **0** | - | - | - | - | 43 | - | - | - | - | - | - |
| **7** | - | - | 63 | 26 | - | - | 42 | **0** | 16 | - | - | 60 | 64 | 18 | - | - | - | - |
| **8** | - | - | - | 47 | 94 | - | - | 17 | **0** | 36 | - | - | - | 82 | - | - | - | - |
| **9** | - | - | - | - | 55 | - | - | - | 40 | **0** | - | - | - | 62 | - | - | - | - |
| **10** | - | 90 | - | - | - | 24 | - | - | - | - | **0** | 69 | - | - | 14 | - | - | 22 |
| **11** | - | - | - | - | - | - | 92 | 85 | - | - | 62 | **0** | 84 | - | 93 | 50 | - | - |
| **12** | - | - | - | - | - | - | - | 70 | - | - | - | 67 | **0** | 66 | - | 80 | 28 | - |
| **13** | - | - | - | - | - | - | - | - | 77 | 93 | - | - | 51 | **0** | - | - | 81 | 44 |
| **14** | - | - | - | - | - | - | - | - | - | - | 44 | 61 | - | - | **0** | 9 | - | 41 |
| **15** | - | - | - | - | - | - | - | - | - | - | - | 89 | 56 | - | 79 | **0** | 13 | 63 |
| **16** | - | - | - | - | - | - | - | - | - | - | - | - | 37 | 12 | - | 59 | **0** | 15 |
| **17** | - | - | - | - | - | - | - | - | - | - | 18 | - | - | - | 18 | 62 | 24 | **0** |

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| **Вариант 3** (выше диагонали), **Вариант 4** (ниже диагонали) | | | | | | | | | | | | | | | | | | |
|  | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** |
| **0** | **0** | 12 | 94 | 77 | 31 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **1** | 56 | **0** | 63 | - | - | 54 | 94 | - | - | - | 46 | - | - | - | - | - | - | - |
| **2** | 56 | 86 | **0** | 57 | - | - | 42 | 25 | - | - | - | - | - | - | - | - | - | - |
| **3** | 79 | - | - | **0** | 67 | - | - | 57 | 42 | - | - | - | - | - | - | - | - | - |
| **4** | 28 | - | - | 85 | **0** | - | - | - | 63 | 7 | - | - | - | - | - | - | - | - |
| **5** | - | 92 | - | - | - | **0** | 51 | - | - | - | 47 | 39 | - | - | - | - | - | - |
| **6** | - | 67 | 79 | - | - | 18 | **0** | - | - | - | - | 70 | - | - | - | - | - | - |
| **7** | - | - | 69 | 79 | - | - | 46 | **0** | 40 | - | - | 22 | 14 | 18 | - | - | - | - |
| **8** | - | - | - | 56 | 90 | - | - | 14 | **0** | 60 | - | - | - | 88 | - | - | - | - |
| **9** | - | - | - | - | 49 | - | - | - | 24 | **0** | - | - | - | 73 | - | - | - | - |
| **10** | - | 31 | - | - | - | 66 | - | - | - | - | **0** | 42 | - | - | 58 | - | - | 61 |
| **11** | - | - | - | - | - | - | 28 | 64 | - | - | 18 | **0** | 30 | - | 10 | 29 | - | - |
| **12** | - | - | - | - | - | - | - | 31 | - | - | - | 34 | **0** | 92 | - | 81 | 12 | - |
| **13** | - | - | - | - | - | - | - | - | 37 | 61 | - | - | 90 | **0** | - | - | 66 | - |
| **14** | - | - | - | - | - | - | - | - | - | - | 54 | 21 | - | - | **0** | 29 | - | 67 |
| **15** | - | - | - | - | - | - | - | - | - | - | - | 94 | 79 | - | 63 | **0** | 26 | 40 |
| **16** | - | - | - | - | - | - | - | - | - | - | - | - | 27 | 86 | - | 74 | **0** | 29 |
| **17** | - | - | - | - | - | - | - | - | - | - | - | - | - | 58 | 71 | 56 | 48 | **0** |

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| **Вариант 5** (выше диагонали), **Вариант 6** (ниже диагонали) | | | | | | | | | | | | | | | | | | |
|  | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** |
| **0** | **0** | 37 | 33 | 45 | 78 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **1** | 6 | **0** | 69 | - | - | 11 | 30 | - | - | - | 57 | - | - | - | - | - | - | - |
| **2** | 59 | 77 | **0** | 44 | - | - | 94 | 94 | - | - | - | - | - | - | - | - | - | - |
| **3** | 51 | - | - | **0** | 66 | - | - | 54 | 41 | - | - | - | - | - | - | - | - | - |
| **4** | 54 | - | - | 11 | **0** | - | - | - | 30 | 28 | - | - | - | - | - | - | - | - |
| **5** | - | 8 | - | - | - | **0** | 51 | - | - | - | 5 | - | - | - | - | - | - | - |
| **6** | - | 30 | 12 | - | - | 14 | **0** | - | - | - | - | 49 | - | - | - | - | - | - |
| **7** | - | - | 73 | 44 | - | - | 21 | **0** | 41 | - | - | 13 | 18 | 34 | - | - | - | - |
| **8** | - | - | - | 46 | 88 | - | - | 43 | **0** | 32 | - | - | - | 81 | - | - | - | - |
| **9** | - | - | - | - | 28 | - | - | - | 30 | **0** | - | - | - | 18 | - | - | - | - |
| **10** | - | 51 | - | - | - | 88 | - | - | - | - | **0** | 33 | - | - | 23 | - | - | - |
| **11** | - | - | - | - | - | - | 37 | 34 | - | - | 15 | **0** | 50 | - | 31 | 9 | - | - |
| **12** | - | - | - | - | - | - | - | 20 | - | - | - | 81 | **0** | 22 | - | 13 | 12 | - |
| **13** | - | - | - | - | - | - | - | - | 19 | 29 | - | - | 17 | **0** | - | - | 45 | - |
| **14** | - | - | - | - | - | - | - | - | - | - | 63 | 19 | - | - | **0** | 77 | - | 54 |
| **15** | - | - | - | - | - | - | - | - | - | - | - | 6 | 45 | - | 11 | **0** | 6 | 22 |
| **16** | - | - | - | - | - | - | - | - | - | - | - | - | 61 | 16 | - | 15 | **0** | 83 |
| **17** | - | - | - | - | - | - | - | - | - | - | 31 | - | - | 63 | 30 | 22 | 65 | **0** |

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| **Вариант 7** (выше диагонали), **Вариант 8** (ниже диагонали) | | | | | | | | | | | | | | | | | | |
|  | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** |
| **0** | **0** | 73 | 41 | 68 | 42 | - | - | - | - | 23 | - | - | - | - | - | - | - | - |
| **1** | 53 | **0** | 6 | - | - | 12 | 95 | - | - | - | 47 | - | - | - | - | - | - | - |
| **2** | 91 | 16 | **0** | 32 | - | - | 44 | 64 | - | - | - | - | - | - | - | - | - | - |
| **3** | 78 | - | - | **0** | 61 | - | - | 52 | 61 | - | - | - | - | - | - | - | - | - |
| **4** | 56 | - | - | 57 | **0** | - | - | - | 39 | 9 | - | - | - | - | - | - | - | - |
| **5** | - | 30 | - | - | - | **0** | 7 | - | - | - | 92 | - | - | - | - | - | - | - |
| **6** | - | 92 | 27 | - | - | 50 | **0** | 33 | - | - | - | 84 | - | - | - | - | - | - |
| **7** | - | - | 38 | 28 | - | - | 35 | **0** | 13 | - | - | 90 | 78 | - | - | - | - | - |
| **8** | - | - | - | 58 | 41 | - | - | 11 | **0** | 12 | - | - | - | 67 | - | - | - | - |
| **9** | - | - | - | - | 40 | - | - | - | 70 | **0** | - | - | - | 43 | - | - | - | - |
| **10** | - | 67 | - | - | - | 32 | - | - | - | - | **0** | 19 | - | - | 5 | - | - | - |
| **11** | - | - | - | - | - | - | 6 | 91 | - | - | 46 | **0** | 75 | - | 77 | 14 | - | - |
| **12** | - | - | - | - | - | - | - | 66 | - | - | - | 20 | **0** | 24 | - | 45 | 64 | - |
| **13** | - | - | - | - | - | - | - | - | 29 | 15 | - | - | 22 | **0** | - | - | 38 | 33 |
| **14** | - | - | - | - | - | - | - | - | - | - | 46 | 5 | - | - | **0** | 49 | - | 88 |
| **15** | - | - | - | - | - | - | - | - | - | - | - | 91 | 92 | - | 90 | **0** | 24 | 10 |
| **16** | - | - | - | - | - | - | - | - | - | - | - | - | 86 | 59 | - | 34 | **0** | 88 |
| **17** | - | - | - | - | - | - | - | - | - | - | 40 | - | - | - | 80 | 72 | 62 | **0** |

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| **Вариант 9** (выше диагонали), **Вариант 10** (ниже диагонали) | | | | | | | | | | | | | | | | | | |
|  | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** |
| **0** | **0** | 47 | 85 | 77 | 36 | - | - | - | - | 35 | - | - | - | - | - | - | - | - |
| **1** | 75 | **0** | 10 | - | - | 46 | 40 | - | - | - | 26 | - | - | - | - | - | - | - |
| **2** | 37 | 81 | **0** | 63 | - | - | 55 | 79 | - | - | - | - | - | - | - | - | - | - |
| **3** | 73 | - | 58 | **0** | 35 | - | - | 49 | 62 | - | - | - | - | - | - | - | - | - |
| **4** | 32 | - | - | 76 | **0** | - | - | - | 46 | 63 | - | - | - | - | - | - | - | - |
| **5** | - | 43 | - | - | - | **0** | 35 | - | - | - | 40 | 15 | - | - | - | - | - | - |
| **6** | - | 87 | 30 | - | - | 12 | **0** | 44 | - | - | - | 49 | - | - | - | - | - | - |
| **7** | - | - | 84 | 49 | - | - | 54 | **0** | 49 | - | - | 55 | 53 | 21 | - | - | - | - |
| **8** | - | - | - | 43 | 6 | - | - | 20 | **0** | 22 | - | - | - | 7 | - | - | - | - |
| **9** | 40 | - | - | - | 77 | - | - | - | 87 | **0** | - | - | - | 37 | - | - | - | - |
| **10** | - | 67 | - | - | - | 32 | - | - | - | - | **0** | 60 | - | - | 33 | - | - | 20 |
| **11** | - | - | - | - | - | - | 52 | 54 | - | - | 57 | **0** | 57 | - | 18 | 75 | - | - |
| **12** | - | - | - | - | - | - | - | 52 | - | - | - | 61 | **0** | 48 | - | 33 | 56 | - |
| **13** | - | - | - | - | - | - | - | - | 61 | 36 | - | - | 58 | **0** | - | - | 68 | 30 |
| **14** | - | - | - | - | - | - | - | - | - | - | 17 | 88 | - | - | **0** | 16 | - | 47 |
| **15** | - | - | - | - | - | - | - | - | - | - | - | 49 | 85 | - | 34 | **0** | 18 | 93 |
| **16** | - | - | - | - | - | - | - | - | - | - | - | - | 89 | 61 | - | 83 | **0** | 72 |
| **17** | - | - | - | - | - | - | - | - | - | - | - | - | - | 20 | 57 | 31 | 30 | **0** |

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| **Вариант 11** (выше диагонали), **Вариант 12** (ниже диагонали) | | | | | | | | | | | | | | | | | | |
|  | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** |
| **0** | **0** | 88 | 10 | 12 | 95 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **1** | 73 | **0** | 76 | - | - | 82 | 60 | - | - | - | 87 | - | - | - | - | - | - | - |
| **2** | 60 | 25 | **0** | - | - | - | 13 | 72 | - | - | - | - | - | - | - | - | - | - |
| **3** | 58 | - | - | **0** | 31 | - | - | 53 | 65 | - | - | - | - | - | - | - | - | - |
| **4** | 28 | - | - | 52 | **0** | - | - | - | 82 | 7 | - | - | - | - | - | - | - | - |
| **5** | - | 57 | - | - | - | **0** | 25 | - | - | - | 69 | - | - | - | - | - | - | - |
| **6** | - | 17 | 23 | - | - | 80 | **0** | - | - | - | - | 95 | - | - | - | - | - | - |
| **7** | - | - | 76 | 29 | - | - | 41 | **0** | 7 | - | - | 19 | 64 | - | - | - | - | - |
| **8** | - | - | - | 8 | 61 | - | - | 87 | **0** | 32 | - | - | - | 26 | - | - | - | - |
| **9** | - | - | - | - | 14 | - | - | - | 23 | **0** | - | - | - | 14 | - | - | - | - |
| **10** | - | 42 | - | - | - | 86 | - | - | - | - | **0** | 61 | - | - | 44 | - | - | - |
| **11** | - | - | - | - | - | - | 48 | 74 | - | - | 77 | **0** | 32 | - | 81 | 7 | - | - |
| **12** | - | - | - | - | - | - | - | 62 | - | - | - | 78 | **0** | 14 | - | 14 | 85 | - |
| **13** | - | - | - | - | - | - | - | - | 48 | 70 | - | - | 49 | **0** | - | - | 8 | 63 |
| **14** | - | - | - | - | - | - | - | - | - | - | 49 | 92 | - | - | **0** | 70 | - | 58 |
| **15** | - | - | - | - | - | - | - | - | - | - | - | 62 | 6 | - | 33 | **0** | 42 | 95 |
| **16** | - | - | - | - | - | - | - | - | - | - | - | - | 61 | 40 | - | 44 | **0** | 44 |
| **17** | - | - | - | - | - | - | - | - | - | - | 26 | - | - | - | 62 | 75 | 11 | **0** |

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| **Вариант 13** (выше диагонали), **Вариант 14** (ниже диагонали) | | | | | | | | | | | | | | | | | | |
|  | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** |
| **0** | **0** | 82 | 36 | 20 | 51 | - | - | - | - | 24 | - | - | - | - | - | - | - | - |
| **1** | 34 | **0** | 54 | - | - | 58 | 58 | - | - | - | 76 | - | - | - | - | - | - | - |
| **2** | 80 | 83 | **0** | - | - | - | 37 | 74 | - | - | - | - | - | - | - | - | - | - |
| **3** | 95 | - | 63 | **0** | 14 | - | - | 35 | 17 | - | - | - | - | - | - | - | - | - |
| **4** | 18 | - | - | 64 | **0** | - | - | - | 52 | 34 | - | - | - | - | - | - | - | - |
| **5** | - | 92 | - | - | - | **0** | 61 | - | - | - | 27 | 50 | - | - | - | - | - | - |
| **6** | - | 94 | 62 | - | - | 63 | **0** | - | - | - | - | 87 | - | - | - | - | - | - |
| **7** | - | - | 67 | 74 | - | - | - | **0** | 19 | - | - | 39 | 51 | - | - | - | - | - |
| **8** | - | - | - | 9 | 15 | - | - | 73 | **0** | 34 | - | - | - | 32 | - | - | - | - |
| **9** | 29 | - | - | - | 72 | - | - | - | 53 | **0** | - | - | - | 71 | - | - | - | - |
| **10** | - | 28 | - | - | - | 30 | - | - | - | - | **0** | 42 | - | - | 89 | - | - | 56 |
| **11** | - | - | - | - | - | 57 | 11 | 88 | - | - | 66 | **0** | 34 | - | 61 | 26 | - | - |
| **12** | - | - | - | - | - | - | - | 34 | - | - | - | 11 | **0** | 62 | - | 71 | 6 | - |
| **13** | - | - | - | - | - | - | - | - | 44 | 72 | - | - | 84 | **0** | - | - | 54 | 40 |
| **14** | - | - | - | - | - | - | - | - | - | - | 94 | 22 | - | - | **0** | 81 | - | 38 |
| **15** | - | - | - | - | - | - | - | - | - | - | - | 8 | 80 | - | 8 | **0** | 44 | 16 |
| **16** | - | - | - | - | - | - | - | - | - | - | - | - | 18 | 26 | - | 13 | **0** | 14 |
| **17** | - | - | - | - | - | - | - | - | - | - | 51 | - | - | - | 28 | 38 | 49 | **0** |

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| **Вариант 15** (выше диагонали), **Вариант 16** (ниже диагонали) | | | | | | | | | | | | | | | | | | |
|  | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** |
| **0** | **0** | 89 | 38 | 89 | 16 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **1** | 49 | **0** | 48 | - | - | 80 | 49 | - | - | - | 77 | - | - | - | - | - | - | - |
| **2** | 54 | 43 | **0** | 65 | - | - | 18 | 47 | - | - | - | - | - | - | - | - | - | - |
| **3** | 53 | - | 32 | **0** | 52 | - | - | 73 | 87 | - | - | - | - | - | - | - | - | - |
| **4** | 84 | - | - | 61 | **0** | - | - | - | 33 | 79 | - | - | - | - | - | - | - | - |
| **5** | - | 25 | - | - | - | **0** | 78 | - | - | - | 65 | 19 | - | - | - | - | - | - |
| **6** | - | 73 | 23 | - | - | 13 | **0** | 54 | - | - | - | 93 | - | - | - | - | - | - |
| **7** | - | - | 81 | 38 | - | - | 15 | **0** | 21 | - | - | 89 | 82 | 42 | - | - | - | - |
| **8** | - | - | - | 63 | 60 | - | - | 47 | **0** | 94 | - | - | - | 41 | - | - | - | - |
| **9** | 27 | - | - | - | 16 | - | - | - | 55 | **0** | - | - | - | 20 | - | - | - | - |
| **10** | - | 68 | - | - | - | 54 | - | - | - | - | **0** | 87 | - | - | 46 | - | - | - |
| **11** | - | - | - | - | - | 38 | 11 | 55 | - | - | 29 | **0** | 78 | - | 87 | 46 | - | - |
| **12** | - | - | - | - | - | - | - | 25 | - | - | - | 86 | **0** | 43 | - | 95 | 69 | - |
| **13** | - | - | - | - | - | - | - | - | 92 | 43 | - | - | 59 | **0** | - | - | 55 | - |
| **14** | - | - | - | - | - | - | - | - | - | - | 8 | 54 | - | - | **0** | 5 | - | 51 |
| **15** | - | - | - | - | - | - | - | - | - | - | - | 39 | 28 | - | 8 | **0** | 70 | 70 |
| **16** | - | - | - | - | - | - | - | - | - | - | - | - | 39 | 7 | - | 54 | **0** | 52 |
| **17** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 29 | 42 | 43 | **0** |

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| **Вариант 17** (выше диагонали), **Вариант 18** (ниже диагонали) | | | | | | | | | | | | | | | | | | |
|  | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** |
| **0** | **0** | 64 | 11 | 24 | 28 | - | - | - | - | 44 | - | - | - | - | - | - | - | - |
| **1** | 71 | **0** | 21 | - | - | 16 | 8 | - | - | - | 9 | - | - | - | - | - | - | - |
| **2** | 71 | 55 | **0** | 23 | - | - | 88 | 80 | - | - | - | - | - | - | - | - | - | - |
| **3** | 66 | - | - | **0** | 26 | - | - | 25 | 73 | - | - | - | - | - | - | - | - | - |
| **4** | 76 | - | - | 87 | **0** | - | - | - | 30 | 54 | - | - | - | - | - | - | - | - |
| **5** | - | 79 | - | - | - | **0** | 68 | - | - | - | 40 | - | - | - | - | - | - | - |
| **6** | - | 76 | 13 | - | - | 45 | **0** | 39 | - | - | - | 67 | - | - | - | - | - | - |
| **7** | - | - | 83 | 10 | - | - | - | **0** | 39 | - | - | 51 | 89 | - | - | - | - | - |
| **8** | - | - | - | 34 | 10 | - | - | 85 | **0** | 75 | - | - | - | 30 | - | - | - | - |
| **9** | - | - | - | - | 65 | - | - | - | 41 | **0** | - | - | - | 5 | - | - | - | - |
| **10** | - | 15 | - | - | - | 60 | - | - | - | - | **0** | 48 | - | - | 29 | - | - | - |
| **11** | - | - | - | - | - | - | 37 | 63 | - | - | 94 | **0** | 78 | - | 77 | 90 | - | - |
| **12** | - | - | - | - | - | - | - | 41 | - | - | - | 40 | **0** | 12 | - | 84 | 67 | - |
| **13** | - | - | - | - | - | - | - | - | 41 | 75 | - | - | 65 | **0** | - | - | 51 | - |
| **14** | - | - | - | - | - | - | - | - | - | - | 58 | 78 | - | - | **0** | 89 | - | 45 |
| **15** | - | - | - | - | - | - | - | - | - | - | - | 94 | 31 | - | 86 | **0** | 42 | 94 |
| **16** | - | - | - | - | - | - | - | - | - | - | - | - | 50 | 63 | - | 94 | **0** | 6 |
| **17** | - | - | - | - | - | - | - | - | - | - | 50 | - | - | 22 | 80 | 83 | 72 | **0** |

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| **Вариант 19** (выше диагонали), **Вариант 20** (ниже диагонали) | | | | | | | | | | | | | | | | | | |
|  | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** |
| **0** | **0** | 48 | 79 | 57 | 38 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **1** | 62 | **0** | 5 | - | - | 41 | 88 | - | - | - | 44 | - | - | - | - | - | - | - |
| **2** | 63 | 58 | **0** | 55 | - | - | 41 | 77 | - | - | - | - | - | - | - | - | - | - |
| **3** | 88 | - | 45 | **0** | 57 | - | - | 39 | 13 | - | - | - | - | - | - | - | - | - |
| **4** | 22 | - | - | 29 | **0** | - | - | - | 72 | 67 | - | - | - | - | - | - | - | - |
| **5** | - | 48 | - | - | - | **0** | 28 | - | - | - | 55 | 55 | - | - | - | - | - | - |
| **6** | - | 17 | 92 | - | - | 35 | **0** | 20 | - | - | - | 46 | - | - | - | - | - | - |
| **7** | - | - | 33 | 95 | - | - | - | **0** | 64 | - | - | 37 | 17 | 40 | - | - | - | - |
| **8** | - | - | - | 38 | 78 | - | - | 88 | **0** | 60 | - | - | - | 85 | - | - | - | - |
| **9** | 44 | - | - | - | 18 | - | - | - | 83 | **0** | - | - | - | 5 | - | - | - | - |
| **10** | - | 23 | - | - | - | 82 | - | - | - | - | **0** | 16 | - | - | 18 | - | - | - |
| **11** | - | - | - | - | - | 58 | 27 | 79 | - | - | 53 | **0** | 18 | - | 18 | 39 | - | - |
| **12** | - | - | - | - | - | - | - | 14 | - | - | - | 74 | **0** | 89 | - | 79 | 40 | - |
| **13** | - | - | - | - | - | - | - | - | 48 | 91 | - | - | 52 | **0** | - | - | 25 | - |
| **14** | - | - | - | - | - | - | - | - | - | - | 95 | 15 | - | - | **0** | 33 | - | 7 |
| **15** | - | - | - | - | - | - | - | - | - | - | - | 42 | 13 | - | 32 | **0** | 46 | 39 |
| **16** | - | - | - | - | - | - | - | - | - | - | - | - | 30 | 19 | - | 24 | **0** | 34 |
| **17** | - | - | - | - | - | - | - | - | - | - | 42 | - | - | 34 | 17 | 32 | 19 | **0** |

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| **Вариант 21** (выше диагонали), **Вариант 22** (ниже диагонали) | | | | | | | | | | | | | | | | | | |
|  | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** |
| **0** | **0** | 65 | 61 | 61 | 60 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **1** | 48 | **0** | 94 | - | - | 58 | 58 | - | - | - | 7 | - | - | - | - | - | - | - |
| **2** | 34 | 63 | **0** | 41 | - | - | 53 | 50 | - | - | - | - | - | - | - | - | - | - |
| **3** | 7 | - | 15 | **0** | 5 | - | - | 34 | 7 | - | - | - | - | - | - | - | - | - |
| **4** | 42 | - | - | 73 | **0** | - | - | - | 89 | 12 | - | - | - | - | - | - | - | - |
| **5** | - | 32 | - | - | - | **0** | 71 | - | - | - | 71 | - | - | - | - | - | - | - |
| **6** | - | 77 | 6 | - | - | 46 | **0** | - | - | - | - | 16 | - | - | - | - | - | - |
| **7** | - | - | 41 | 80 | - | - | - | **0** | 13 | - | - | 86 | 80 | - | - | - | - | - |
| **8** | - | - | - | 53 | 78 | - | - | 91 | **0** | 32 | - | - | - | 68 | - | - | - | - |
| **9** | - | - | - | - | 5 | - | - | - | 47 | **0** | - | - | - | 78 | - | - | - | - |
| **10** | - | 16 | - | - | - | 17 | - | - | - | - | **0** | 17 | - | - | 34 | - | - | 52 |
| **11** | - | - | - | - | - | - | 19 | 75 | - | - | 53 | **0** | 72 | - | 58 | 71 | - | - |
| **12** | - | - | - | - | - | - | - | 93 | - | - | - | 43 | **0** | 16 | - | 89 | 89 | - |
| **13** | - | - | - | - | - | - | - | 20 | 62 | 84 | - | - | 23 | **0** | - | - | 47 | - |
| **14** | - | - | - | - | - | - | - | - | - | - | 79 | 49 | - | - | **0** | 55 | - | 92 |
| **15** | - | - | - | - | - | - | - | - | - | - | - | 95 | 19 | - | 24 | **0** | 68 | 44 |
| **16** | - | - | - | - | - | - | - | - | - | - | - | - | 82 | 60 | - | 32 | **0** | 67 |
| **17** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 47 | 95 | 64 | **0** |

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| **Вариант 23** (выше диагонали), **Вариант 24** (ниже диагонали) | | | | | | | | | | | | | | | | | | |
|  | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** |
| **0** | **0** | 13 | 69 | 78 | 44 | - | - | - | - | 57 | - | - | - | - | - | - | - | - |
| **1** | 20 | **0** | 84 | - | - | 67 | 62 | - | - | - | 89 | - | - | - | - | - | - | - |
| **2** | 55 | 44 | **0** | 23 | - | - | 33 | 9 | - | - | - | - | - | - | - | - | - | - |
| **3** | 28 | - | 39 | **0** | 43 | - | - | 94 | 5 | - | - | - | - | - | - | - | - | - |
| **4** | 85 | - | - | 36 | **0** | - | - | - | 92 | 7 | - | - | - | - | - | - | - | - |
| **5** | - | 33 | - | - | - | **0** | 28 | - | - | - | 52 | - | - | - | - | - | - | - |
| **6** | - | 85 | 63 | - | - | 76 | **0** | 31 | - | - | - | 32 | - | - | - | - | - | - |
| **7** | - | - | 39 | 79 | - | - | - | **0** | 58 | - | - | 78 | 87 | - | - | - | - | - |
| **8** | - | - | - | 79 | 24 | - | - | 15 | **0** | 46 | - | - | - | 28 | - | - | - | - |
| **9** | 40 | - | - | - | 62 | - | - | - | 49 | **0** | - | - | - | 54 | - | - | - | - |
| **10** | - | 42 | - | - | - | 59 | - | - | - | - | **0** | 75 | - | - | 18 | - | - | 31 |
| **11** | - | - | - | - | - | 33 | 66 | 13 | - | - | 42 | **0** | 44 | - | 80 | 23 | - | - |
| **12** | - | - | - | - | - | - | - | 72 | - | - | - | 10 | **0** | 76 | - | 54 | 48 | - |
| **13** | - | - | - | - | - | - | - | - | 38 | 86 | - | - | 32 | **0** | - | - | 29 | 21 |
| **14** | - | - | - | - | - | - | - | - | - | - | 75 | 45 | - | - | **0** | 22 | - | 9 |
| **15** | - | - | - | - | - | - | - | - | - | - | - | 71 | 57 | - | 90 | **0** | 92 | 62 |
| **16** | - | - | - | - | - | - | - | - | - | - | - | - | 5 | 6 | - | 27 | **0** | 44 |
| **17** | - | - | - | - | - | - | - | - | - | - | 32 | - | - | - | 31 | 56 | 43 | **0** |

Приложение 2

Матрица потоков для графа из задания № 2

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| **Вариант 1** | | | | | | | | | | | | | **Вариант 2** | | | | | | | | | | | |
|  | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| **1** | 0 | 7 | 11 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 11 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **2** | 0 | 0 | 0 | 0 | 7 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 5 | 0 | 0 | 0 | 0 | 0 |
| **3** | 0 | 0 | 0 | 0 | 7 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| **4** | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 4 | 0 | 0 | 7 | 0 | 0 | 0 |
| **5** | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 |
| **6** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 1 | 2 | 0 | 0 | 0 |
| **7** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 |
| **8** | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 5 | 0 | 3 | 0 |
| **9** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 2 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 7 | 2 |
| **10** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 11 |
| **11** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 8 |
| **12** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Вариант 3** | | | | | | | | | | | | | **Вариант 4** | | | | | | | | | | | |
|  | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| **1** | 0 | 8 | 12 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 8 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **2** | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **3** | 0 | 0 | 0 | 4 | 6 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 5 | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| **4** | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| **5** | 0 | 0 | 0 | 0 | 0 | 7 | 2 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 7 | 0 | 0 | 0 | 0 |
| **6** | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 5 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 7 | 0 | 0 | 0 |
| **7** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 |
| **8** | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 7 | 5 | 2 | 0 |
| **9** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 2 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 8 | 0 |
| **10** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 |
| **11** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 |
| **12** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Вариант 5** | | | | | | | | | | | | | **Вариант 6** | | | | | | | | | | | |
|  | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| **1** | 0 | 7 | 11 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 7 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **2** | 0 | 0 | 0 | 0 | 7 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **3** | 0 | 0 | 0 | 0 | 7 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 4 | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| **4** | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 7 | 0 | 0 | 2 | 0 | 0 | 0 |
| **5** | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 7 | 2 | 0 | 0 | 0 | 0 |
| **6** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 1 | 7 | 0 | 0 | 0 |
| **7** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 3 |
| **8** | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 3 | 0 | 8 | 0 |
| **9** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 2 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 6 | 0 |
| **10** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 13 |
| **11** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 |
| **12** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Вариант 7** | | | | | | | | | | | | | **Вариант 8** | | | | | | | | | | | |
|  | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| **1** | 0 | 9 | 8 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 11 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **2** | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **3** | 0 | 4 | 0 | 6 | 2 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 7 | 1 | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| **4** | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| **5** | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 8 | 0 | 0 | 0 | 0 |
| **6** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 2 | 4 | 0 | 0 | 0 |
| **7** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 |
| **8** | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 6 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 2 | 3 | 0 |
| **9** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 3 | 3 |
| **10** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 |
| **11** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 |
| **12** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Вариант 9** | | | | | | | | | | | | | **Вариант 10** | | | | | | | | | | | |
|  | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| **1** | 0 | 6 | 11 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 9 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **2** | 0 | 0 | 0 | 0 | 6 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| **3** | 0 | 0 | 0 | 3 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 8 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| **4** | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 1 | 0 | 0 | 5 | 0 | 0 | 0 |
| **5** | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 2 | 5 | 0 | 0 | 0 | 0 |
| **6** | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 6 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 3 | 0 | 0 | 0 |
| **7** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| **8** | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 4 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 1 | 7 | 0 |
| **9** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 8 | 6 |
| **10** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 |
| **11** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 14 |
| **12** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Вариант 11** | | | | | | | | | | | | | **Вариант 12** | | | | | | | | | | | |
|  | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| **1** | 0 | 9 | 10 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 11 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **2** | 0 | 0 | 3 | 0 | 7 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 0 | 5 | 0 | 0 | 0 | 0 | 0 |
| **3** | 0 | 2 | 0 | 0 | 3 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 8 | 7 | 0 | 0 | 0 | 0 | 0 | 0 |
| **4** | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| **5** | 0 | 0 | 0 | 0 | 0 | 6 | 8 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| **6** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 0 | 0 | 0 |
| **7** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 7 |
| **8** | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 3 | 4 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 7 | 7 | 0 |
| **9** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 2 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 7 | 0 |
| **10** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 |
| **11** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 12 |
| **12** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Вариант 13** | | | | | | | | | | | | | **Вариант 14** | | | | | | | | | | | |
|  | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| **1** | 0 | 6 | 9 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 7 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **2** | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 4 | 0 | 0 | 0 | 0 | 0 |
| **3** | 0 | 0 | 0 | 0 | 5 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 6 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| **4** | 0 | 0 | 5 | 0 | 0 | 6 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 6 | 0 | 0 | 7 | 0 | 0 | 0 |
| **5** | 0 | 0 | 0 | 0 | 0 | 5 | 1 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 8 | 0 | 0 | 0 | 0 |
| **6** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 8 | 0 | 0 | 0 |
| **7** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| **8** | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 4 | 0 |
| **9** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 5 | 0 |
| **10** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 9 |
| **11** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| **12** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Вариант 15** | | | | | | | | | | | | | **Вариант 16** | | | | | | | | | | | |
|  | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| **1** | 0 | 11 | 6 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 12 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **2** | 0 | 0 | 8 | 0 | 3 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 4 | 0 | 6 | 0 | 0 | 0 | 0 | 0 |
| **3** | 0 | 0 | 0 | 0 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 4 | 2 | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| **4** | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 |
| **5** | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 3 | 6 | 0 | 0 | 0 | 0 |
| **6** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 1 | 0 | 0 | 0 |
| **7** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 |
| **8** | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 2 | 6 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 2 | 0 |
| **9** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 0 |
| **10** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 11 |
| **11** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 9 |
| **12** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Вариант 17** | | | | | | | | | | | | | **Вариант 18** | | | | | | | | | | | |
|  | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| **1** | 0 | 7 | 11 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 9 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **2** | 0 | 0 | 3 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 2 | 0 | 8 | 0 | 0 | 0 | 0 | 0 |
| **3** | 0 | 0 | 0 | 0 | 6 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| **4** | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 2 | 0 | 0 | 5 | 0 | 0 | 0 |
| **5** | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 7 | 0 | 0 | 0 | 0 |
| **6** | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 2 | 0 | 0 | 0 |
| **7** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 1 |
| **8** | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 8 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 5 | 0 | 3 | 0 |
| **9** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 0 |
| **10** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11 |
| **11** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 13 |
| **12** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Вариант 19** | | | | | | | | | | | | | **Вариант 20** | | | | | | | | | | | |
|  | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| **1** | 0 | 6 | 12 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 9 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **2** | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 5 | 0 | 0 | 0 | 0 | 0 |
| **3** | 0 | 3 | 0 | 0 | 8 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 6 | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| **4** | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 5 | 0 | 0 | 3 | 0 | 0 | 0 |
| **5** | 0 | 0 | 0 | 0 | 0 | 8 | 8 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 4 | 5 | 0 | 0 | 0 | 0 |
| **6** | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 4 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 5 | 0 | 0 | 0 |
| **7** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 |
| **8** | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 2 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 8 | 0 | 2 | 0 |
| **9** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 2 | 4 |
| **10** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 12 |
| **11** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 12 |
| **12** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Вариант 21** | | | | | | | | | | | | | **Вариант 22** | | | | | | | | | | | |
|  | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| **1** | 0 | 7 | 11 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 6 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **2** | 0 | 0 | 0 | 0 | 7 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **3** | 0 | 0 | 0 | 0 | 7 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 4 | 6 | 7 | 0 | 0 | 0 | 0 | 0 | 0 |
| **4** | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| **5** | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 |
| **6** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 5 | 0 | 0 | 0 |
| **7** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **8** | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 4 | 5 | 3 | 0 |
| **9** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 2 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 3 | 7 |
| **10** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11 |
| **11** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 |
| **12** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Вариант 23** | | | | | | | | | | | | | **Вариант 24** | | | | | | | | | | | |
|  | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| **1** | 0 | 9 | 7 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 6 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **2** | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **3** | 0 | 6 | 0 | 0 | 4 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| **4** | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| **5** | 0 | 0 | 0 | 0 | 0 | 7 | 2 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 8 | 0 | 0 | 0 | 0 | 0 |
| **6** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 8 | 5 | 0 | 0 | 0 |
| **7** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 |
| **8** | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 4 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 3 | 0 | 1 | 0 |
| **9** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 4 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 2 | 0 |
| **10** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 9 |
| **11** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 7 |
| **12** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Приложение 3

Значение логической функции  из задания № 3

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Переменные | | | | Функция *f* (по вариантам) | | | | | | | | | | | |
| *x*1 | *x*2 | *x*3 | *x*4 | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 |
| 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 |
| 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 |
| 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 |
| 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 |
| 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 |
| 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Переменные | | | | Функция *f* (по вариантам) | | | | | | | | | | | |
| *x*1 | *x*2 | *x*3 | *x*4 | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **22** | **23** | **24** |
| 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 |
| 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 |
| 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 |
| 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 |
| 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 |
| 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 |