## Тематика и содержание лабораторной работы №2 по

##  дисциплине «Методы оптимальных решений»

## *Тема лабораторной работы: «Элементы теории парных игр»*

*Задание 1.*

Торговый посредник может приобрести для последующей перепродажи товары четырех видов ($A\_{1}, A\_{2},A\_{3},A\_{4}$). Реализация и прибыль (в у.е.) зависят от вида товара и состояния спроса. Спрос в зависимости от макроэкономической ситуации и других факторов (например, сезонности) может принимать одно из трех состояний ($C\_{1}, C\_{2},C\_{3}$). Эти состояния не характеризуются стохастической неопределенностью и не прогнозируются.

Определить оптимальные пропорции приобретения товаров по критерию максимума средней гарантированной прибыли при заданной матрице прибыли (табл. 2.1, где$ n\_{1}$-номер варианта).

Последовательность выполнения задания:

1. Используя платежную матрицу игры «с природой» найти нижнюю и верхнюю цены игры и сделать вывод о наличии (отсутствии) седловой точки.
2. Составить пару двойственных задач (с позиции приобретаемых товаров – стратегия закупок; с позиции спроса – стратегия «природа»).
3. Решить эти задачи с использованием стандартного пакета прикладных программ ЗЛП (например, «Поиск решения» в MS Excel или QSB).
4. Сравнить полученные решения и сделать необходимые проверки.
5. Представить ответ в развернутом виде.

*Задание 2.*

В табл. 2.2, где$ n\_{2}$-номер варианта, приведена платежная матрица игры «с природой»: $A\_{i} \left(i=\overbar{1,4}\right)$ – стратегия игрока, $B\_{j} \left(j=\overbar{1,6}\right)$ – состояние «природы».

Требуется:

1. Найти матрицу рисков.
2. Определить оптимальную стратегию: а) по критерию крайнего пессимизма (критерий Вальда), б) критерий минимаксного риска (критерий Сэвиджа), в) критерий максимального средневзвешенного выигрыша (критерий Гурвица) для ρ=0,3 и ρ=0,7.
3. Сравнить полученные в п.2 результаты с позиции используемых критериев. Привести обоснованные выводы.

Табл.2.1 (тестовый вариант)

|  |  |  |  |
| --- | --- | --- | --- |
|  | $$C\_{1}$$ | $$C\_{2}$$ | $$C\_{3}$$ |
| $$A\_{1}$$ | 15 | 18 | 12 |
| $$A\_{2}$$ | 14 | 10 | 8 |
| $$A\_{3}$$ | 12 | 20 | 10 |
| $$A\_{4}$$ | 16 | 14 | 15 |

Табл.2.2 (тестовый вариант)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | $$B\_{1}$$ | $$B\_{2}$$ | $$B\_{3}$$ | $$B\_{4}$$ | $$B\_{5}$$ | $$B\_{6}$$ |
| $$A\_{1}$$ | 1 | 3 | 4 | 2 | 8 | 6 |
| $$A\_{2}$$ | -1 | 2 | 5 | 8 | 3 | 10 |
| $$A\_{3}$$ | -4 | 1 | 2 | 4 | 3 | -2 |
| $$A\_{4}$$ | 5 | 6 | 1 | -1 | 2 | 8 |

**Таблицы вариантов**

|  |  |
| --- | --- |
| Таблица 2.1.1 | Таблица 2.1.2 |
|

|  |  |  |  |
| --- | --- | --- | --- |
|  | $$C\_{1}$$ | $$C\_{2}$$ | $$C\_{3}$$ |
| $$A\_{1}$$ | 6 | 14 | 8 |
| $$A\_{2}$$ | 10 | 18 | 22 |
| $$A\_{3}$$ | 8 | 20 | 6 |
| $$A\_{4}$$ | 16 | 8 | 10 |

 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | $$B\_{1}$$ | $$B\_{2}$$ | $$B\_{3}$$ | $$B\_{4}$$ | $$B\_{5}$$ | $$B\_{6}$$ |
| $$A\_{1}$$ | 4 | 6 | 2 | 0 | -1 | 4 |
| $$A\_{2}$$ | -7 | 4 | 0 | 4 | 0 | 7 |
| $$A\_{3}$$ | 3 | 2 | 2 | -3 | 5 | -3 |
| $$A\_{4}$$ | 1 | -3 | 5 | 2 | -2 | 5 |

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|  |  |
| --- | --- |
| Таблица 2.1.2 | Таблица 2.2.2 |
|

|  |  |  |  |
| --- | --- | --- | --- |
|  | $$C\_{1}$$ | $$C\_{2}$$ | $$C\_{3}$$ |
| $$A\_{1}$$ | 8 | 12 | 10 |
| $$A\_{2}$$ | 14 | 20 | 22 |
| $$A\_{3}$$ | 6 | 8 | 14 |
| $$A\_{4}$$ | 10 | 12 | 6 |

 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | $$B\_{1}$$ | $$B\_{2}$$ | $$B\_{3}$$ | $$B\_{4}$$ | $$B\_{5}$$ | $$B\_{6}$$ |
| $$A\_{1}$$ | -3 | 4 | -2 | 5 | -7 | 10 |
| $$A\_{2}$$ | 8 | -3 | 6 | -2 | 3 | -1 |
| $$A\_{3}$$ | 4 | 2 | 10 | 6 | -1 | 4 |
| $$A\_{4}$$ | 5 | 4 | -1 | 8 | 0 | 10 |

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|  |  |
| --- | --- |
| Таблица 2.1.3 | Таблица 2.2.3 |
|

|  |  |  |  |
| --- | --- | --- | --- |
|  | $$C\_{1}$$ | $$C\_{2}$$ | $$C\_{3}$$ |
| $$A\_{1}$$ | 20 | 8 | 10 |
| $$A\_{2}$$ | 12 | 14 | 8 |
| $$A\_{3}$$ | 6 | 16 | 22 |
| $$A\_{4}$$ | 20 | 10 | 12 |

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|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | $$B\_{1}$$ | $$B\_{2}$$ | $$B\_{3}$$ | $$B\_{4}$$ | $$B\_{5}$$ | $$B\_{6}$$ |
| $$A\_{1}$$ | 1 | 0 | 8 | 3 | 5 | 4 |
| $$A\_{2}$$ | 3 | 2 | 7 | -2 | -1 | 2 |
| $$A\_{3}$$ | 4 | 6 | 5 | 0 | 7 | -1 |
| $$A\_{4}$$ | -2 | -3 | 1 | 4 | 0 | 6 |

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|  |  |
| --- | --- |
| Таблица 2.1.4 | Таблица 2.2.4 |
|

|  |  |  |  |
| --- | --- | --- | --- |
|  | $$C\_{1}$$ | $$C\_{2}$$ | $$C\_{3}$$ |
| $$A\_{1}$$ | 4 | 12 | 8 |
| $$A\_{2}$$ | 10 | 6 | 12 |
| $$A\_{3}$$ | 12 | 8 | 6 |
| $$A\_{4}$$ | 8 | 4 | 20 |

 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | $$B\_{1}$$ | $$B\_{2}$$ | $$B\_{3}$$ | $$B\_{4}$$ | $$B\_{5}$$ | $$B\_{6}$$ |
| $$A\_{1}$$ | 6 | 3 | -2 | 0 | 5 | 3 |
| $$A\_{2}$$ | 5 | 4 | 7 | 6 | -4 | 2 |
| $$A\_{3}$$ | -1 | 1 | 3 | -2 | 0 | 4 |
| $$A\_{4}$$ | 4 | -2 | 0 | -1 | 2 | -3 |

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|  |  |
| --- | --- |
| Таблица 2.1.5 | Таблица 2.2.5 |
|

|  |  |  |  |
| --- | --- | --- | --- |
|  | $$C\_{1}$$ | $$C\_{2}$$ | $$C\_{3}$$ |
| $$A\_{1}$$ | 12 | 20 | 15 |
| $$A\_{2}$$ | 8 | 14 | 10 |
| $$A\_{3}$$ | 6 | 8 | 12 |
| $$A\_{4}$$ | 10 | 12 | 8 |

 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | $$B\_{1}$$ | $$B\_{2}$$ | $$B\_{3}$$ | $$B\_{4}$$ | $$B\_{5}$$ | $$B\_{6}$$ |
| $$A\_{1}$$ | 8 | 5 | 7 | -1 | 10 | 6 |
| $$A\_{2}$$ | 6 | -2 | 5 | 4 | 7 | 0 |
| $$A\_{3}$$ | 4 | 3 | -2 | 3 | -5 | 2 |
| $$A\_{4}$$ | 9 | 0 | 6 | 0 | 4 | 1 |

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|  |  |
| --- | --- |
| Таблица 2.1.6 | Таблица 2.2.6 |
|

|  |  |  |  |
| --- | --- | --- | --- |
|  | $$C\_{1}$$ | $$C\_{2}$$ | $$C\_{3}$$ |
| $$A\_{1}$$ | 20 | 16 | 12 |
| $$A\_{2}$$ | 14 | 18 | 10 |
| $$A\_{3}$$ | 10 | 12 | 8 |
| $$A\_{4}$$ | 12 | 14 | 10 |

 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | $$B\_{1}$$ | $$B\_{2}$$ | $$B\_{3}$$ | $$B\_{4}$$ | $$B\_{5}$$ | $$B\_{6}$$ |
| $$A\_{1}$$ | 16 | 12 | 8 | 6 | 10 | 15 |
| $$A\_{2}$$ | 10 | 2 | 0 | -1 | 8 | 14 |
| $$A\_{3}$$ | 8 | 6 | 4 | 9 | 11 | 13 |
| $$A\_{4}$$ | 7 | 8 | 10 | 0 | -2 | 3 |

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|  |  |
| --- | --- |
| Таблица 2.1.7 | Таблица 2.2.7 |
|

|  |  |  |  |
| --- | --- | --- | --- |
|  | $$C\_{1}$$ | $$C\_{2}$$ | $$C\_{3}$$ |
| $$A\_{1}$$ | 12 | 16 | 10 |
| $$A\_{2}$$ | 8 | 14 | 16 |
| $$A\_{3}$$ | 10 | 8 | 18 |
| $$A\_{4}$$ | 6 | 15 | 20 |

 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | $$B\_{1}$$ | $$B\_{2}$$ | $$B\_{3}$$ | $$B\_{4}$$ | $$B\_{5}$$ | $$B\_{6}$$ |
| $$A\_{1}$$ | -6 | 1 | 12 | 8 | -2 | 1 |
| $$A\_{2}$$ | 7 | 4 | 10 | 6 | 0 | 12 |
| $$A\_{3}$$ | 5 | 0 | 6 | 4 | 1 | 11 |
| $$A\_{4}$$ | 9 | 0 | 6 | 0 | 4 | 1 |

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|  |  |
| --- | --- |
| Таблица 2.1.8 | Таблица 2.2.8 |
|

|  |  |  |  |
| --- | --- | --- | --- |
|  | $$C\_{1}$$ | $$C\_{2}$$ | $$C\_{3}$$ |
| $$A\_{1}$$ | 10 | 8 | 16 |
| $$A\_{2}$$ | 14 | 20 | 18 |
| $$A\_{3}$$ | 12 | 10 | 8 |
| $$A\_{4}$$ | 6 | 14 | 10 |

 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | $$B\_{1}$$ | $$B\_{2}$$ | $$B\_{3}$$ | $$B\_{4}$$ | $$B\_{5}$$ | $$B\_{6}$$ |
| $$A\_{1}$$ | 2 | 1 | 0 | 5 | 0 | 14 |
| $$A\_{2}$$ | 4 | 2 | -1 | 8 | -1 | 12 |
| $$A\_{3}$$ | 8 | 6 | -2 | 10 | -2 | 8 |
| $$A\_{4}$$ | 3 | 4 | 4 | 4 | 1 | 6 |

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|  |  |
| --- | --- |
| Таблица 2.1.9 | Таблица 2.2.9 |
|

|  |  |  |  |
| --- | --- | --- | --- |
|  | $$C\_{1}$$ | $$C\_{2}$$ | $$C\_{3}$$ |
| $$A\_{1}$$ | 15 | 18 | 12 |
| $$A\_{2}$$ | 10 | 14 | 8 |
| $$A\_{3}$$ | 6 | 20 | 14 |
| $$A\_{4}$$ | 12 | 15 | 10 |

 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | $$B\_{1}$$ | $$B\_{2}$$ | $$B\_{3}$$ | $$B\_{4}$$ | $$B\_{5}$$ | $$B\_{6}$$ |
| $$A\_{1}$$ | 6 | 7 | 4 | 2 | 5 | 1 |
| $$A\_{2}$$ | 5 | 8 | 3 | -1 | 8 | 4 |
| $$A\_{3}$$ | 4 | 9 | 8 | -3 | 10 | -2 |
| $$A\_{4}$$ | 10 | 6 | 5 | 0 | 4 | 3 |

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|  |  |
| --- | --- |
| Таблица 2.1.10 | Таблица 2.2.10 |
|

|  |  |  |  |
| --- | --- | --- | --- |
|  | $$C\_{1}$$ | $$C\_{2}$$ | $$C\_{3}$$ |
| $$A\_{1}$$ | 14 | 10 | 20 |
| $$A\_{2}$$ | 15 | 8 | 10 |
| $$A\_{3}$$ | 18 | 14 | 12 |
| $$A\_{4}$$ | 12 | 15 | 10 |

 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | $$B\_{1}$$ | $$B\_{2}$$ | $$B\_{3}$$ | $$B\_{4}$$ | $$B\_{5}$$ | $$B\_{6}$$ |
| $$A\_{1}$$ | 4 | 5 | 3 | 8 | 10 | 4 |
| $$A\_{2}$$ | 2 | 7 | 8 | 5 | 8 | 12 |
| $$A\_{3}$$ | 0 | 10 | 8 | 4 | -1 | 14 |
| $$A\_{4}$$ | 8 | 4 | 6 | 8 | 6 | 6 |

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|  |  |
| --- | --- |
| Таблица 2.1.11 | Таблица 2.2.11 |
|

|  |  |  |  |
| --- | --- | --- | --- |
|  | $$C\_{1}$$ | $$C\_{2}$$ | $$C\_{3}$$ |
| $$A\_{1}$$ | 18 | 20 | 10 |
| $$A\_{2}$$ | 12 | 6 | 8 |
| $$A\_{3}$$ | 10 | 14 | 12 |
| $$A\_{4}$$ | 16 | 8 | 14 |

 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | $$B\_{1}$$ | $$B\_{2}$$ | $$B\_{3}$$ | $$B\_{4}$$ | $$B\_{5}$$ | $$B\_{6}$$ |
| $$A\_{1}$$ | 6 | 2 | 10 | 12 | 5 | 7 |
| $$A\_{2}$$ | 5 | 4 | 4 | 9 | 8 | 9 |
| $$A\_{3}$$ | 8 | 8 | 12 | 10 | 6 | -1 |
| $$A\_{4}$$ | 2 | 1 | 3 | 5 | 4 | 0 |

 |

|  |  |
| --- | --- |
| Таблица 2.1.12 | Таблица 2.2.12 |
|

|  |  |  |  |
| --- | --- | --- | --- |
|  | $$C\_{1}$$ | $$C\_{2}$$ | $$C\_{3}$$ |
| $$A\_{1}$$ | 10 | 8 | 12 |
| $$A\_{2}$$ | 6 | 10 | 8 |
| $$A\_{3}$$ | 8 | 18 | 10 |
| $$A\_{4}$$ | 12 | 15 | 14 |

 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | $$B\_{1}$$ | $$B\_{2}$$ | $$B\_{3}$$ | $$B\_{4}$$ | $$B\_{5}$$ | $$B\_{6}$$ |
| $$A\_{1}$$ | 2 | 4 | 5 | 12 | 8 | 7 |
| $$A\_{2}$$ | 5 | 6 | 4 | 8 | 5 | -1 |
| $$A\_{3}$$ | 3 | 8 | 6 | 14 | 14 | 10 |
| $$A\_{4}$$ | 1 | 3 | 2 | 0 | 20 | 2 |

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|  |  |
| --- | --- |
| Таблица 2.1.13 | Таблица 2.2.13 |
|

|  |  |  |  |
| --- | --- | --- | --- |
|  | $$C\_{1}$$ | $$C\_{2}$$ | $$C\_{3}$$ |
| $$A\_{1}$$ | 10 | 12 | 8 |
| $$A\_{2}$$ | 8 | 14 | 11 |
| $$A\_{3}$$ | 12 | 10 | 6 |
| $$A\_{4}$$ | 15 | 8 | 12 |

 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | $$B\_{1}$$ | $$B\_{2}$$ | $$B\_{3}$$ | $$B\_{4}$$ | $$B\_{5}$$ | $$B\_{6}$$ |
| $$A\_{1}$$ | 9 | 8 | 10 | 2 | 4 | 12 |
| $$A\_{2}$$ | 5 | 4 | 12 | 5 | 10 | 5 |
| $$A\_{3}$$ | 7 | 3 | 8 | 6 | 8 | 4 |
| $$A\_{4}$$ | 4 | 6 | 3 | 8 | 3 | 10 |

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|  |  |
| --- | --- |
| Таблица 2.1.14 | Таблица 2.2.14 |
|

|  |  |  |  |
| --- | --- | --- | --- |
|  | $$C\_{1}$$ | $$C\_{2}$$ | $$C\_{3}$$ |
| $$A\_{1}$$ | 12 | 14 | 10 |
| $$A\_{2}$$ | 11 | 10 | 15 |
| $$A\_{3}$$ | 8 | 6 | 12 |
| $$A\_{4}$$ | 10 | 8 | 16 |

 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | $$B\_{1}$$ | $$B\_{2}$$ | $$B\_{3}$$ | $$B\_{4}$$ | $$B\_{5}$$ | $$B\_{6}$$ |
| $$A\_{1}$$ | 8 | 12 | 10 | 5 | 4 | 15 |
| $$A\_{2}$$ | 6 | 8 | 6 | 2 | -1 | 10 |
| $$A\_{3}$$ | 10 | 9 | 9 | 3 | 2 | 8 |
| $$A\_{4}$$ | 4 | 11 | 12 | 5 | 5 | 14 |

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|  |  |
| --- | --- |
| Таблица 2.1.15 | Таблица 2.2.15 |
|

|  |  |  |  |
| --- | --- | --- | --- |
|  | $$C\_{1}$$ | $$C\_{2}$$ | $$C\_{3}$$ |
| $$A\_{1}$$ | 12 | 8 | 10 |
| $$A\_{2}$$ | 14 | 11 | 18 |
| $$A\_{3}$$ | 18 | 14 | 16 |
| $$A\_{4}$$ | 10 | 6 | 20 |

 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | $$B\_{1}$$ | $$B\_{2}$$ | $$B\_{3}$$ | $$B\_{4}$$ | $$B\_{5}$$ | $$B\_{6}$$ |
| $$A\_{1}$$ | 3 | 2 | 4 | 5 | 3 | 6 |
| $$A\_{2}$$ | -2 | 5 | 6 | 8 | 2 | 1 |
| $$A\_{3}$$ | 0 | 1 | 2 | 10 | 4 | 6 |
| $$A\_{4}$$ | 1 | 3 | 1 | 12 | 8 | 0 |

 |

|  |  |
| --- | --- |
| Таблица 2.1.16 | Таблица 2.2.16 |
|

|  |  |  |  |
| --- | --- | --- | --- |
|  | $$C\_{1}$$ | $$C\_{2}$$ | $$C\_{3}$$ |
| $$A\_{1}$$ | 10 | 8 | 14 |
| $$A\_{2}$$ | 6 | 11 | 16 |
| $$A\_{3}$$ | 8 | 10 | 18 |
| $$A\_{4}$$ | 11 | 6 | 20 |

 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | $$B\_{1}$$ | $$B\_{2}$$ | $$B\_{3}$$ | $$B\_{4}$$ | $$B\_{5}$$ | $$B\_{6}$$ |
| $$A\_{1}$$ | 7 | 5 | 10 | 14 | 6 | 3 |
| $$A\_{2}$$ | 8 | 4 | 9 | 10 | 4 | 5 |
| $$A\_{3}$$ | 10 | 3 | 11 | 15 | 8 | 9 |
| $$A\_{4}$$ | 5 | 1 | 2 | -1 | 3 | 4 |

 |

|  |  |
| --- | --- |
| Таблица 2.1.17 | Таблица 2.2.17 |
|

|  |  |  |  |
| --- | --- | --- | --- |
|  | $$C\_{1}$$ | $$C\_{2}$$ | $$C\_{3}$$ |
| $$A\_{1}$$ | 10 | 12 | 8 |
| $$A\_{2}$$ | 14 | 11 | 9 |
| $$A\_{3}$$ | 16 | 14 | 10 |
| $$A\_{4}$$ | 12 | 8 | 12 |

 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | $$B\_{1}$$ | $$B\_{2}$$ | $$B\_{3}$$ | $$B\_{4}$$ | $$B\_{5}$$ | $$B\_{6}$$ |
| $$A\_{1}$$ | 5 | 3 | 6 | -1 | 2 | 1 |
| $$A\_{2}$$ | 4 | 11 | 5 | -3 | 4 | 11 |
| $$A\_{3}$$ | 9 | 8 | 3 | 1 | 6 | 10 |
| $$A\_{4}$$ | 2 | 10 | 0 | 4 | 5 | 5 |

 |

|  |  |
| --- | --- |
| Таблица 2.1.18 | Таблица 2.2.18 |
|

|  |  |  |  |
| --- | --- | --- | --- |
|  | $$C\_{1}$$ | $$C\_{2}$$ | $$C\_{3}$$ |
| $$A\_{1}$$ | 11 | 10 | 12 |
| $$A\_{2}$$ | 12 | 8 | 9 |
| $$A\_{3}$$ | 14 | 11 | 18 |
| $$A\_{4}$$ | 8 | 16 | 10 |

 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | $$B\_{1}$$ | $$B\_{2}$$ | $$B\_{3}$$ | $$B\_{4}$$ | $$B\_{5}$$ | $$B\_{6}$$ |
| $$A\_{1}$$ | 3 | 5 | 4 | 2 | 7 | 9 |
| $$A\_{2}$$ | 10 | 12 | 8 | 5 | 3 | 11 |
| $$A\_{3}$$ | 13 | 6 | 10 | 12 | 2 | 1 |
| $$A\_{4}$$ | 8 | 5 | 3 | 7 | 4 | 6 |

 |

|  |  |
| --- | --- |
| Таблица 2.1.19 | Таблица 2.2.19 |
|

|  |  |  |  |
| --- | --- | --- | --- |
|  | $$C\_{1}$$ | $$C\_{2}$$ | $$C\_{3}$$ |
| $$A\_{1}$$ | 11 | 15 | 14 |
| $$A\_{2}$$ | 20 | 18 | 10 |
| $$A\_{3}$$ | 15 | 16 | 12 |
| $$A\_{4}$$ | 18 | 14 | 18 |

 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | $$B\_{1}$$ | $$B\_{2}$$ | $$B\_{3}$$ | $$B\_{4}$$ | $$B\_{5}$$ | $$B\_{6}$$ |
| $$A\_{1}$$ | 10 | 8 | 14 | 12 | 11 | 9 |
| $$A\_{2}$$ | 9 | 5 | 3 | 5 | 10 | 7 |
| $$A\_{3}$$ | 11 | 12 | 5 | 4 | 8 | 5 |
| $$A\_{4}$$ | 5 | 4 | 11 | 3 | 12 | 8 |

 |

|  |  |
| --- | --- |
| Таблица 2.1.20 | Таблица 2.2.20 |
|

|  |  |  |  |
| --- | --- | --- | --- |
|  | $$C\_{1}$$ | $$C\_{2}$$ | $$C\_{3}$$ |
| $$A\_{1}$$ | 8 | 10 | 6 |
| $$A\_{2}$$ | 11 | 14 | 10 |
| $$A\_{3}$$ | 10 | 8 | 14 |
| $$A\_{4}$$ | 18 | 11 | 12 |

 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | $$B\_{1}$$ | $$B\_{2}$$ | $$B\_{3}$$ | $$B\_{4}$$ | $$B\_{5}$$ | $$B\_{6}$$ |
| $$A\_{1}$$ | 4 | 2 | -1 | 7 | 5 | 4 |
| $$A\_{2}$$ | 3 | 6 | 4 | 8 | 3 | 5 |
| $$A\_{3}$$ | 5 | 3 | 7 | 3 | 5 | 2 |
| $$A\_{4}$$ | -1 | 0 | 5 | 4 | 2 | 3 |

 |

|  |  |
| --- | --- |
| Таблица 2.1.21 | Таблица 2.2.21 |
|

|  |  |  |  |
| --- | --- | --- | --- |
|  | $$C\_{1}$$ | $$C\_{2}$$ | $$C\_{3}$$ |
| $$A\_{1}$$ | 10 | 12 | 8 |
| $$A\_{2}$$ | 11 | 14 | 10 |
| $$A\_{3}$$ | 6 | 15 | 6 |
| $$A\_{4}$$ | 10 | 8 | 11 |

 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | $$B\_{1}$$ | $$B\_{2}$$ | $$B\_{3}$$ | $$B\_{4}$$ | $$B\_{5}$$ | $$B\_{6}$$ |
| $$A\_{1}$$ | 5 | 2 | 3 | 6 | 4 | 1 |
| $$A\_{2}$$ | 1 | 5 | -1 | 0 | 2 | 3 |
| $$A\_{3}$$ | 0 | 4 | 2 | 3 | 5 | 1 |
| $$A\_{4}$$ | -1 | 6 | 10 | 9 | 8 | 7 |

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|  |  |
| --- | --- |
| Таблица 2.1.22 | Таблица 2.2.22 |
|

|  |  |  |  |
| --- | --- | --- | --- |
|  | $$C\_{1}$$ | $$C\_{2}$$ | $$C\_{3}$$ |
| $$A\_{1}$$ | 12 | 10 | 11 |
| $$A\_{2}$$ | 14 | 16 | 8 |
| $$A\_{3}$$ | 8 | 11 | 9 |
| $$A\_{4}$$ | 15 | 20 | 10 |

 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | $$B\_{1}$$ | $$B\_{2}$$ | $$B\_{3}$$ | $$B\_{4}$$ | $$B\_{5}$$ | $$B\_{6}$$ |
| $$A\_{1}$$ | 3 | 5 | 4 | 6 | 7 | 9 |
| $$A\_{2}$$ | 1 | 4 | 3 | 2 | 3 | 7 |
| $$A\_{3}$$ | 2 | 3 | 5 | 7 | 2 | 2 |
| $$A\_{4}$$ | 4 | 2 | 3 | 4 | 8 | 4 |

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|  |  |
| --- | --- |
| Таблица 2.1.23 | Таблица 2.2.23 |
|

|  |  |  |  |
| --- | --- | --- | --- |
|  | $$C\_{1}$$ | $$C\_{2}$$ | $$C\_{3}$$ |
| $$A\_{1}$$ | 10 | 20 | 15 |
| $$A\_{2}$$ | 14 | 16 | 8 |
| $$A\_{3}$$ | 12 | 14 | 18 |
| $$A\_{4}$$ | 8 | 12 | 10 |

 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | $$B\_{1}$$ | $$B\_{2}$$ | $$B\_{3}$$ | $$B\_{4}$$ | $$B\_{5}$$ | $$B\_{6}$$ |
| $$A\_{1}$$ | 0 | 1 | 4 | 3 | 2 | -1 |
| $$A\_{2}$$ | 3 | 2 | 5 | 4 | 1 | 6 |
| $$A\_{3}$$ | 0 | 4 | 2 | 3 | 5 | 1 |
| $$A\_{4}$$ | -1 | 6 | 10 | 9 | 8 | 7 |

 |

|  |  |
| --- | --- |
| Таблица 2.1.24 | Таблица 2.2.24 |
|

|  |  |  |  |
| --- | --- | --- | --- |
|  | $$C\_{1}$$ | $$C\_{2}$$ | $$C\_{3}$$ |
| $$A\_{1}$$ | 9 | 11 | 12 |
| $$A\_{2}$$ | 10 | 15 | 8 |
| $$A\_{3}$$ | 12 | 14 | 10 |
| $$A\_{4}$$ | 18 | 6 | 11 |

 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | $$B\_{1}$$ | $$B\_{2}$$ | $$B\_{3}$$ | $$B\_{4}$$ | $$B\_{5}$$ | $$B\_{6}$$ |
| $$A\_{1}$$ | 8 | 5 | 10 | 3 | 8 | 9 |
| $$A\_{2}$$ | 6 | 4 | 12 | 5 | 10 | 8 |
| $$A\_{3}$$ | 11 | 1 | 15 | 4 | 2 | 10 |
| $$A\_{4}$$ | 14 | 2 | 11 | -1 | 1 | 9 |

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|  |  |
| --- | --- |
| Таблица 2.1.25 | Таблица 2.2.25 |
|

|  |  |  |  |
| --- | --- | --- | --- |
|  | $$C\_{1}$$ | $$C\_{2}$$ | $$C\_{3}$$ |
| $$A\_{1}$$ | 14 | 11 | 16 |
| $$A\_{2}$$ | 16 | 15 | 11 |
| $$A\_{3}$$ | 10 | 18 | 12 |
| $$A\_{4}$$ | 8 | 12 | 10 |

 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | $$B\_{1}$$ | $$B\_{2}$$ | $$B\_{3}$$ | $$B\_{4}$$ | $$B\_{5}$$ | $$B\_{6}$$ |
| $$A\_{1}$$ | 11 | 8 | 10 | 12 | 3 | 4 |
| $$A\_{2}$$ | 2 | 3 | 6 | 4 | 2 | 1 |
| $$A\_{3}$$ | 10 | 5 | 7 | 3 | 4 | 5 |
| $$A\_{4}$$ | 8 | 6 | 8 | 2 | 10 | 8 |

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