МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РОССИЙСКОЙ ФЕДЕРАЦИИ

федеральное государственное бюджетное образовательное учреждение

высшего образования

**«УЛЬЯНОВСКИЙ ГОСУДАРСТВЕННЫЙ ТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ»**

Кафедра «Вычислительная техника»

Дисциплина «Теория принятия решения»

**Лабораторная работа №1.**

**Транспортная задача**

Выполнил:

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**Метод дифференциальных рент**

При решении ТЗ методом дифференциальных рент наилучшим образом распределяют часть продукции между потребителями и на последующих итерациях постоянно уменьшают общую величину нераспределенных поставок.

**Алгоритм метода**:

**1)** В каждом столбце определяется минимальный тариф, и соответствующая клетка помечается.

**2)** Отмеченные клетки заполняются максимально возможными поставками.

**3)** Оцениваются поставщики:

а) строки, соответствующие поставщикам, запасы которых неисчерпаны, являются положительными, а запасы, которых исчерпаны, а потребности отмеченных потребителей неудовлетворены (с учетом всего столбца), являются отрицательными;

в) строки, соответствующие поставщикам, запасы которых исчерпаны, а потребности отмеченных потребителей удовлетворены (с учетом всех заполненных клеток столбца), имеют нулевую оценку; при этом, если заполненная клетка в нулевой строке связана через столбец с заполненной клеткой в отрицательной строке, то данная нулевая строка считается отрицательной, во всех других случаях – положительной.

**4)** Для каждого столбца, имеющего отмеченный тариф в отрицательной строке, находится разность между отмеченным тарифом и минимальным по величине тарифом, стоящим в положительной строке (может быть отмеченным).

**5)** Среди полученных разностей, отличных от 0, определяется минимальная. Это число называется промежуточной рентой.

**6)** Строится новая таблица, при этом тарифы, стоящие в положительных строках, переписываются без изменения, а тарифы, стоящие в отрицательных строках, увеличиваются на величину промежуточной ренты.

**7)** Переход к пункту 1.

Замечание 8.2. Если в строке или столбце окажется более одной выделенной клетки, то заполняются в первую очередь выделенные клетки, которые являются единственными в строке или столбце.

Замечание 8.3. Если удается распределить все запасы, то получен оптимальный план.

Замечание 8.4. При расчете оптимальной целевой функции необходимо вернуться к тарифам исходной таблицы, так как в последующих таблицах тарифы испорчены дифференциальными рентами.

**Решение транспортной задачи:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | Пункты  отправления | Пункты назначения | | | | | Запасы | | *B*1 | *B*2 | *B*3 | *B*4 | *B*5 | | *A*1 | |  | | --- | | 33 | | |  | | --- | | 45 | | |  | | --- | | 27 | | |  | | --- | | 37 | | |  | | --- | | 25 | | |  | | --- | | 1000 | | | *A*2 | |  | | --- | | 17 | | |  | | --- | | 57 | | |  | | --- | | 43 | | |  | | --- | | 49 | | |  | | --- | | 45 | | |  | | --- | | 700 | | | *A*3 | |  | | --- | | 41 | | |  | | --- | | 39 | | |  | | --- | | 51 | | |  | | --- | | 53 | | |  | | --- | | 39 | | |  | | --- | | 800 | | | *A*4 | |  | | --- | | 23 | | |  | | --- | | 25 | | |  | | --- | | 27 | | |  | | --- | | 41 | | |  | | --- | | 43 | | |  | | --- | | 500 | | | Потребности | |  | | --- | | 640 | | |  | | --- | | 480 | | |  | | --- | | 735 | | |  | | --- | | 500 | | |  | | --- | | 365 | | |  | | --- | |  | | |

Наличие груза у поставщиков равно:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ∑ *A*i= | |  | | --- | | 1000 | | + | |  | | --- | | 700 | | + | |  | | --- | | 800 | | + | |  | | --- | | 500 | | = | |  | | --- | | 3000 | |  |

Общая потребность в грузе в пунктах назначения равна:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ∑ *B*i= | |  | | --- | | 640 | | + | |  | | --- | | 480 | | + | |  | | --- | | 735 | | + | |  | | --- | | 500 | | + | |  | | --- | | 365 | | = | |  | | --- | | 2720 | |  |

∑ *A*i≥∑ *B*i. Модель транспортной задачи является открытой. Чтобы получить закрытую модель, введем дополнительный пункт назначения *B*6 c потребностьями 3000− 2720=280. Тарифы перевозки из пунктов отправления в *B*6 полагаем равными нулю. В результате получим закрытую модель транспортной задачи.

∑ *A*i=∑ *B*i. Модель транспортной задачи является закрытой. Следовательно, она разрешима.

Найдем оптимальный план транспортной задачи *методом: дифференциальных рент*.

**Итерация 1:**

В каждом из столбцов таблицы находим минимальные тарифы и заключаем в рамки.

Сначала находим те столбцы (строки) в которых есть только одна клетка для заполнения. Заполнив ее, исключаем из рассмотрения данный столбец (строку) и переходим к заполнению следующей клетки.

Последовательность заполнения клеток следующее: *A*2*B*1, *A*4*B*2, *A*4*B*3, *A*1*B*4, *A*1*B*5, *A*1*B*6,

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Пункты  отправления | Пункты назначения | | | | | | | | | | | | Запасы | | *B*1 | | *B*2 | | *B*3 | | *B*4 | | *B*5 | | *B*6 | | | *A*1 | |  | | --- | | 33 | |  | |  | | --- | | 45 | |  | |  | | --- | | 27 | |  | |  |  | | --- | --- | | |  | | --- | | 37 | | |  | |  |  | | --- | --- | | |  | | --- | | 25 | | |  | |  |  | | --- | --- | | |  | | --- | | 0 | | |  | |  | | --- | | 1000 | | |  |  |  |  |  |  |  | |  | | --- | | 500 | |  | |  | | --- | | 365 | |  | |  | | --- | | 135 | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | *A*2 | |  |  | | --- | --- | | |  | | --- | | 17 | | |  | |  | | --- | | 57 | |  | |  | | --- | | 43 | |  | |  | | --- | | 49 | |  | |  | | --- | | 45 | |  | |  | | --- | | 0 | |  | |  | | --- | | 700 | | |  | |  | | --- | | 640 | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 60 | |  |  | | | *A*3 | |  | | --- | | 41 | |  | |  | | --- | | 39 | |  | |  | | --- | | 51 | |  | |  | | --- | | 53 | |  | |  | | --- | | 39 | |  | |  | | --- | | 0 | |  | |  | | --- | | 800 | | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 800 | |  |  | | | *A*4 | |  | | --- | | 23 | |  | |  |  | | --- | --- | | |  | | --- | | 27 | | |  | |  |  | | --- | --- | | |  | | --- | | 25 | | |  | |  | | --- | | 41 | |  | |  | | --- | | 43 | |  | |  | | --- | | 0 | |  | |  | | --- | | 500 | | |  |  |  | |  | | --- | | 480 | |  | |  | | --- | | 20 | |  |  |  |  |  |  | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | Потребности | |  | | --- | | 640 | | | |  | | --- | | 480 | | | |  | | --- | | 735 | | | |  | | --- | | 500 | | | |  | | --- | | 365 | | | |  | | --- | | 280 | | | |  | | --- | | 3000 | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 715 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 145 | |  |  | | | |

В результате заполнения отмеченных клеток получен *условно оптимальный план*.

После получения условно оптимального плана определяем избыточные и недостаточные строки.

Строка *A*1 является недостаточной, поскольку запасы пункта отправления *A*1 распределены полностью, а потребности пункта назначения *B*6 удовлетворены частично. При этом величина недостатка равна 145.

Строка *A*4 является недостаточной, поскольку запасы пункта отправления *A*4 распределены полностью, а потребности пункта назначения *B*3 удовлетворены частично. При этом величина недостатка равна 715.

Строка *A*2 является избыточным, поскольку запасы пункта отправления *A*2 распределены не полностью. При этом величина избытка этой строки равна 60.

Строка *A*3 является избыточным, поскольку запасы пункта отправления *A*3 распределены не полностью. При этом величина избытка этой строки равна 800.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Пункты  отправления | Пункты назначения | | | | | | | | | | | | Запасы | Недостаток (−),  избыток (+) | | *B*1 | | *B*2 | | *B*3 | | *B*4 | | *B*5 | | *B*6 | | | *A*1 | |  | | --- | | 33 | |  | |  | | --- | | 45 | |  | |  | | --- | | 27 | |  | |  |  | | --- | --- | | |  | | --- | | 37 | | |  | |  |  | | --- | --- | | |  | | --- | | 25 | | |  | |  |  | | --- | --- | | |  | | --- | | 0 | | |  | |  | | --- | | 1000 | | |  |  |  | | --- | --- | --- | | − | |  | | --- | | 145 | | | |  |  |  |  |  |  |  | |  | | --- | | 500 | |  | |  | | --- | | 365 | |  | |  | | --- | | 135 | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | *A*2 | |  |  | | --- | --- | | |  | | --- | | 17 | | |  | |  | | --- | | 57 | |  | |  | | --- | | 43 | |  | |  | | --- | | 49 | |  | |  | | --- | | 45 | |  | |  | | --- | | 0 | |  | |  | | --- | | 700 | | |  |  |  | | --- | --- | --- | | + | |  | | --- | | 60 | | | |  | |  | | --- | | 640 | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 60 | |  |  | | | *A*3 | |  | | --- | | 41 | |  | |  | | --- | | 39 | |  | |  | | --- | | 51 | |  | |  | | --- | | 53 | |  | |  | | --- | | 39 | |  | |  | | --- | | 0 | |  | |  | | --- | | 800 | | |  |  |  | | --- | --- | --- | | + | |  | | --- | | 800 | | | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 800 | |  |  | | | *A*4 | |  | | --- | | 23 | |  | |  |  | | --- | --- | | |  | | --- | | 27 | | |  | |  |  | | --- | --- | | |  | | --- | | 25 | | |  | |  | | --- | | 41 | |  | |  | | --- | | 43 | |  | |  | | --- | | 0 | |  | |  | | --- | | 500 | | |  |  |  | | --- | --- | --- | | − | |  | | --- | | 715 | | | |  |  |  | |  | | --- | | 480 | |  | |  | | --- | | 20 | |  |  |  |  |  |  | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | Потребности | |  | | --- | | 640 | | | |  | | --- | | 480 | | | |  | | --- | | 735 | | | |  | | --- | | 500 | | | |  | | --- | | 365 | | | |  | | --- | | 280 | | | |  | | --- | | 3000 | |  | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 715 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 145 | |  |  | | | |

* Нераспределенный остаток равен 860.
* Суммарный объем поставок равен: 3000 – 860 = 2140.

После определения избыточных и недостаточных строк, по каждому из столбцов находим разности между минимальными тарифами, записанными в избыточных строках, и тарифами, стоящими в заполненных клетках.

Для столбца 1 разность не определена, так как число, записанное в рамке в данном столбце, находится в положительной строке.

В столбце 2 минимальный тариф в избыточных строках равно 39, а число, стоящее в рамке равно 27. Следовательно, разность для данного столбца равна 39−27=12.

В столбце 3 минимальный тариф в избыточных строках равно 43, а число, стоящее в рамке равно 25. Следовательно, разность для данного столбца равна 43−25=18.

В столбце 4 минимальный тариф в избыточных строках равно 49, а число, стоящее в рамке равно 37. Следовательно, разность для данного столбца равна 49−37=12.

В столбце 5 минимальный тариф в избыточных строках равно 39, а число, стоящее в рамке равно 25. Следовательно, разность для данного столбца равна 39−25=14.

В столбце 6 минимальный тариф в избыточных строках равно 0, а число, стоящее в рамке равно 0. Следовательно, разность для данного столбца равна 0−0=0.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Пункты  отправления | Пункты назначения | | | | | | | | | | | | Запасы | Недостаток (−),  избыток (+) | | *B*1 | | *B*2 | | *B*3 | | *B*4 | | *B*5 | | *B*6 | | | *A*1 | |  | | --- | | 33 | |  | |  | | --- | | 45 | |  | |  | | --- | | 27 | |  | |  |  | | --- | --- | | |  | | --- | | 37 | | |  | |  |  | | --- | --- | | |  | | --- | | 25 | | |  | |  |  | | --- | --- | | |  | | --- | | 0 | | |  | |  | | --- | | 1000 | | |  |  |  | | --- | --- | --- | | − | |  | | --- | | 145 | | | |  |  |  |  |  |  |  | |  | | --- | | 500 | |  | |  | | --- | | 365 | |  | |  | | --- | | 135 | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | *A*2 | |  |  | | --- | --- | | |  | | --- | | 17 | | |  | |  | | --- | | 57 | |  | |  | | --- | | 43 | |  | |  | | --- | | 49 | |  | |  | | --- | | 45 | |  | |  | | --- | | 0 | |  | |  | | --- | | 700 | | |  |  |  | | --- | --- | --- | | + | |  | | --- | | 60 | | | |  | |  | | --- | | 640 | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 60 | |  |  | | | *A*3 | |  | | --- | | 41 | |  | |  | | --- | | 39 | |  | |  | | --- | | 51 | |  | |  | | --- | | 53 | |  | |  | | --- | | 39 | |  | |  | | --- | | 0 | |  | |  | | --- | | 800 | | |  |  |  | | --- | --- | --- | | + | |  | | --- | | 800 | | | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 800 | |  |  | | | *A*4 | |  | | --- | | 23 | |  | |  |  | | --- | --- | | |  | | --- | | 27 | | |  | |  |  | | --- | --- | | |  | | --- | | 25 | | |  | |  | | --- | | 41 | |  | |  | | --- | | 43 | |  | |  | | --- | | 0 | |  | |  | | --- | | 500 | | |  |  |  | | --- | --- | --- | | − | |  | | --- | | 715 | | | |  |  |  | |  | | --- | | 480 | |  | |  | | --- | | 20 | |  |  |  |  |  |  | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | Потребности | |  | | --- | | 640 | | | |  | | --- | | 480 | | | |  | | --- | | 735 | | | |  | | --- | | 500 | | | |  | | --- | | 365 | | | |  | | --- | | 280 | | | |  | | --- | | 3000 | |  | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 715 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 145 | |  |  | | | | Разность | − | | |  | | --- | | 12 | | | |  | | --- | | 18 | | | |  | | --- | | 12 | | | |  | | --- | | 14 | | | |  | | --- | | 0 | | |  |  | |

Выбираем наименьшую из найденных разностей, которая является промежуточной рентой. В данном случае промежуточная рента равна 0 и находится в столбце *B*6. Далее переходим к следующей таблице. В этой таблице в строках (являющихся избыточными) переписываем соответствующие тарифы из предыдущей таблицы, а тарифы недостаточных строках получаются в результате прибавления к ним величину промежуточной ренты, т.е. 0.

**Итерация 2:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Пункты  отправления | Пункты назначения | | | | | | | | | | | | Запасы | Недостаток (−),  избыток (+) | | *B*1 | | *B*2 | | *B*3 | | *B*4 | | *B*5 | | *B*6 | | | *A*1 | |  | | --- | | 33 | |  | |  | | --- | | 45 | |  | |  | | --- | | 27 | |  | |  |  | | --- | --- | | |  | | --- | | 37 | | |  | |  |  | | --- | --- | | |  | | --- | | 25 | | |  | |  |  | | --- | --- | | |  | | --- | | 0 | | |  | |  | | --- | | 1000 | | |  |  |  | | --- | --- | --- | | + | |  | | --- | | 0 | | | |  |  |  |  |  |  |  | |  | | --- | | 500 | |  | |  | | --- | | 365 | |  | |  | | --- | | 135 | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | *A*2 | |  |  | | --- | --- | | |  | | --- | | 17 | | |  | |  | | --- | | 57 | |  | |  | | --- | | 43 | |  | |  | | --- | | 49 | |  | |  | | --- | | 45 | |  | |  |  | | --- | --- | | |  | | --- | | 0 | | |  | |  | | --- | | 700 | | |  |  |  | | --- | --- | --- | | + | |  | | --- | | 0 | | | |  | |  | | --- | | 640 | |  |  |  |  |  |  |  |  |  | |  | | --- | | 60 | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | *A*3 | |  | | --- | | 41 | |  | |  | | --- | | 39 | |  | |  | | --- | | 51 | |  | |  | | --- | | 53 | |  | |  | | --- | | 39 | |  | |  |  | | --- | --- | | |  | | --- | | 0 | | |  | |  | | --- | | 800 | | |  |  |  | | --- | --- | --- | | + | |  | | --- | | 715 | | | |  |  |  |  |  |  |  |  |  |  |  | |  | | --- | | 85 | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 715 | |  |  | | | *A*4 | |  | | --- | | 23 | |  | |  |  | | --- | --- | | |  | | --- | | 27 | | |  | |  |  | | --- | --- | | |  | | --- | | 25 | | |  | |  | | --- | | 41 | |  | |  | | --- | | 43 | |  | |  |  | | --- | --- | | |  | | --- | | 0 | | |  | |  | | --- | | 500 | | |  |  |  | | --- | --- | --- | | − | |  | | --- | | 715 | | | |  |  |  | |  | | --- | | 480 | |  | |  | | --- | | 20 | |  |  |  |  |  | |  | | --- | | 0 | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | Потребности | |  | | --- | | 640 | | | |  | | --- | | 480 | | | |  | | --- | | 735 | | | |  | | --- | | 500 | | | |  | | --- | | 365 | | | |  | | --- | | 280 | | | |  | | --- | | 3000 | |  | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 715 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | | Разность | − | | |  | | --- | | 12 | | | |  | | --- | | 2 | | | − | | − | | − | |  |  | |

**Итерация 3:**

|  |
| --- |
|  |
| Пункты  отправления | Пункты назначения | | | | | | | | | | | | Запасы | Недостаток (−),  избыток (+) |
| *B*1 | | *B*2 | | *B*3 | | *B*4 | | *B*5 | | *B*6 | |
| *A*1 | |  | | --- | | 33 | |  | |  | | --- | | 45 | |  | |  |  | | --- | --- | | |  | | --- | | 27 | | |  | |  |  | | --- | --- | | |  | | --- | | 37 | | |  | |  |  | | --- | --- | | |  | | --- | | 25 | | |  | |  |  | | --- | --- | | |  | | --- | | 0 | | |  | |  | | --- | | 1000 | | |  |  |  | | --- | --- | --- | | − | |  | | --- | | 580 | | |
|  |  |  |  |  | |  | | --- | | 135 | |  | |  | | --- | | 500 | |  | |  | | --- | | 365 | |  | |  | | --- | | 0 | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | |
| *A*2 | |  |  | | --- | --- | | |  | | --- | | 17 | | |  | |  | | --- | | 57 | |  | |  | | --- | | 43 | |  | |  | | --- | | 49 | |  | |  | | --- | | 45 | |  | |  |  | | --- | --- | | |  | | --- | | 0 | | |  | |  | | --- | | 700 | | |  |  |  | | --- | --- | --- | | + | |  | | --- | | 0 | | |
|  | |  | | --- | | 640 | |  |  |  |  |  |  |  |  |  | |  | | --- | | 60 | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | |
| *A*3 | |  | | --- | | 41 | |  | |  | | --- | | 39 | |  | |  | | --- | | 51 | |  | |  | | --- | | 53 | |  | |  | | --- | | 39 | |  | |  |  | | --- | --- | | |  | | --- | | 0 | | |  | |  | | --- | | 800 | | |  |  |  | | --- | --- | --- | | + | |  | | --- | | 580 | | |
|  |  |  |  |  |  |  |  |  |  |  | |  | | --- | | 220 | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 580 | |  |  | |
| *A*4 | |  | | --- | | 25 | |  | |  |  | | --- | --- | | |  | | --- | | 29 | | |  | |  |  | | --- | --- | | |  | | --- | | 27 | | |  | |  | | --- | | 43 | |  | |  | | --- | | 45 | |  | |  | | --- | | 2 | |  | |  | | --- | | 500 | | |  |  |  | | --- | --- | --- | | − | |  | | --- | | 0 | | |
|  |  |  | |  | | --- | | 480 | |  | |  | | --- | | 20 | |  |  |  |  |  |  | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | |
| Потребности | |  | | --- | | 640 | | | |  | | --- | | 480 | | | |  | | --- | | 735 | | | |  | | --- | | 500 | | | |  | | --- | | 365 | | | |  | | --- | | 280 | | | |  | | --- | | 3000 | |  |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 580 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | |
| Разность | − | | |  | | --- | | 10 | | | |  | | --- | | 16 | | | |  | | --- | | 12 | | | |  | | --- | | 14 | | | − | |  |  |

**Итерация 4:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Пункты  отправления | Пункты назначения | | | | | | | | | | | | Запасы | Недостаток (−),  избыток (+) | | *B*1 | | *B*2 | | *B*3 | | *B*4 | | *B*5 | | *B*6 | | | *A*1 | |  | | --- | | 43 | |  | |  | | --- | | 55 | |  | |  |  | | --- | --- | | |  | | --- | | 37 | | |  | |  |  | | --- | --- | | |  | | --- | | 47 | | |  | |  |  | | --- | --- | | |  | | --- | | 35 | | |  | |  | | --- | | 10 | |  | |  | | --- | | 1000 | | |  |  |  | | --- | --- | --- | | − | |  | | --- | | 100 | | | |  |  |  |  |  | |  | | --- | | 135 | |  | |  | | --- | | 500 | |  | |  | | --- | | 365 | |  |  | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | *A*2 | |  |  | | --- | --- | | |  | | --- | | 17 | | |  | |  | | --- | | 57 | |  | |  | | --- | | 43 | |  | |  | | --- | | 49 | |  | |  | | --- | | 45 | |  | |  |  | | --- | --- | | |  | | --- | | 0 | | |  | |  | | --- | | 700 | | |  |  |  | | --- | --- | --- | | + | |  | | --- | | 0 | | | |  | |  | | --- | | 640 | |  |  |  |  |  |  |  |  |  | |  | | --- | | 60 | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | *A*3 | |  | | --- | | 41 | |  | |  |  | | --- | --- | | |  | | --- | | 39 | | |  | |  | | --- | | 51 | |  | |  | | --- | | 53 | |  | |  | | --- | | 39 | |  | |  |  | | --- | --- | | |  | | --- | | 0 | | |  | |  | | --- | | 800 | | |  |  |  | | --- | --- | --- | | + | |  | | --- | | 100 | | | |  |  |  | |  | | --- | | 480 | |  |  |  |  |  |  |  | |  | | --- | | 220 | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 100 | |  |  | | | *A*4 | |  | | --- | | 35 | |  | |  |  | | --- | --- | | |  | | --- | | 39 | | |  | |  |  | | --- | --- | | |  | | --- | | 37 | | |  | |  | | --- | | 53 | |  | |  | | --- | | 55 | |  | |  | | --- | | 12 | |  | |  | | --- | | 500 | | |  |  |  | | --- | --- | --- | | − | |  | | --- | | 0 | | | |  |  |  | |  | | --- | | 0 | |  | |  | | --- | | 500 | |  |  |  |  |  |  | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | Потребности | |  | | --- | | 640 | | | |  | | --- | | 480 | | | |  | | --- | | 735 | | | |  | | --- | | 500 | | | |  | | --- | | 365 | | | |  | | --- | | 280 | | | |  | | --- | | 3000 | |  | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 100 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | | Разность | − | | − | | |  | | --- | | 6 | | | |  | | --- | | 2 | | | |  | | --- | | 4 | | | − | |  |  | |

**Итерация 5:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Пункты  отправления | Пункты назначения | | | | | | | | | | | | Запасы | Недостаток (−),  избыток (+) |
| *B*1 | | *B*2 | | *B*3 | | *B*4 | | *B*5 | | *B*6 | |
| *A*1 | |  | | --- | | 45 | |  | |  | | --- | | 57 | |  | |  |  | | --- | --- | | |  | | --- | | 39 | | |  | |  |  | | --- | --- | | |  | | --- | | 49 | | |  | |  |  | | --- | --- | | |  | | --- | | 37 | | |  | |  | | --- | | 12 | |  | |  | | --- | | 1000 | | |  |  |  | | --- | --- | --- | | − | |  | | --- | | 40 | | |
|  |  |  |  |  | |  | | --- | | 235 | |  | |  | | --- | | 400 | |  | |  | | --- | | 365 | |  |  | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | |
| *A*2 | |  |  | | --- | --- | | |  | | --- | | 17 | | |  | |  | | --- | | 57 | |  | |  | | --- | | 43 | |  | |  |  | | --- | --- | | |  | | --- | | 49 | | |  | |  | | --- | | 45 | |  | |  |  | | --- | --- | | |  | | --- | | 0 | | |  | |  | | --- | | 700 | | |  |  |  | | --- | --- | --- | | − | |  | | --- | | 0 | | |
|  | |  | | --- | | 640 | |  |  |  |  |  | |  | | --- | | 60 | |  |  |  | |  | | --- | | 0 | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | |
| *A*3 | |  | | --- | | 41 | |  | |  |  | | --- | --- | | |  | | --- | | 39 | | |  | |  | | --- | | 51 | |  | |  | | --- | | 53 | |  | |  | | --- | | 39 | |  | |  |  | | --- | --- | | |  | | --- | | 0 | | |  | |  | | --- | | 800 | | |  |  |  | | --- | --- | --- | | + | |  | | --- | | 40 | | |
|  |  |  | |  | | --- | | 480 | |  |  |  |  |  |  |  | |  | | --- | | 280 | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 40 | |  |  | |
| *A*4 | |  | | --- | | 37 | |  | |  | | --- | | 41 | |  | |  |  | | --- | --- | | |  | | --- | | 39 | | |  | |  | | --- | | 55 | |  | |  | | --- | | 57 | |  | |  | | --- | | 14 | |  | |  | | --- | | 500 | | |  |  |  | | --- | --- | --- | | − | |  | | --- | | 0 | | |
|  |  |  |  |  | |  | | --- | | 500 | |  |  |  |  |  |  | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | |
| Потребности | |  | | --- | | 640 | | | |  | | --- | | 480 | | | |  | | --- | | 735 | | | |  | | --- | | 500 | | | |  | | --- | | 365 | | | |  | | --- | | 280 | | | |  | | --- | | 3000 | |  |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 40 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | |
| Разность | |  | | --- | | 24 | | | − | | |  | | --- | | 12 | | | |  | | --- | | 4 | | | |  | | --- | | 2 | | | − | |  |  |

**Итерация 6:**

В каждом из столбцов таблицы находим минимальные тарифы и заключаем в рамки. Заполняем клетки, в которых стоят указанные числа. Сначала находим те столбцы (строки) в которых есть только одна клетка для заполнения. Заполнив ее, исключаем из рассмотрения данный столбец (строку) и переходим к заполнению следующей клетки.

Последовательность заполнения клеток следующее: *A*2*B*1, *A*3*B*2, *A*3*B*6, *A*2*B*4, *A*3*B*5, *A*4*B*3, *A*1*B*3, *A*1*B*4, *A*1*B*5,

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Пункты  отправления | Пункты назначения | | | | | | | | | | | | Запасы | | *B*1 | | *B*2 | | *B*3 | | *B*4 | | *B*5 | | *B*6 | | | *A*1 | |  | | --- | | 47 | |  | |  | | --- | | 59 | |  | |  |  | | --- | --- | | |  | | --- | | 41 | | |  | |  |  | | --- | --- | | |  | | --- | | 51 | | |  | |  |  | | --- | --- | | |  | | --- | | 39 | | |  | |  | | --- | | 14 | |  | |  | | --- | | 1000 | | |  |  |  |  |  | |  | | --- | | 235 | |  | |  | | --- | | 440 | |  | |  | | --- | | 325 | |  |  | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | *A*2 | |  |  | | --- | --- | | |  | | --- | | 19 | | |  | |  | | --- | | 59 | |  | |  | | --- | | 45 | |  | |  |  | | --- | --- | | |  | | --- | | 51 | | |  | |  | | --- | | 47 | |  | |  | | --- | | 2 | |  | |  | | --- | | 700 | | |  | |  | | --- | | 640 | |  |  |  |  |  | |  | | --- | | 60 | |  |  |  |  | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | *A*3 | |  | | --- | | 41 | |  | |  |  | | --- | --- | | |  | | --- | | 39 | | |  | |  | | --- | | 51 | |  | |  | | --- | | 53 | |  | |  |  | | --- | --- | | |  | | --- | | 39 | | |  | |  |  | | --- | --- | | |  | | --- | | 0 | | |  | |  | | --- | | 800 | | |  |  |  | |  | | --- | | 480 | |  |  |  |  |  | |  | | --- | | 40 | |  | |  | | --- | | 280 | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | *A*4 | |  | | --- | | 39 | |  | |  | | --- | | 43 | |  | |  |  | | --- | --- | | |  | | --- | | 41 | | |  | |  | | --- | | 57 | |  | |  | | --- | | 59 | |  | |  | | --- | | 16 | |  | |  | | --- | | 500 | | |  |  |  |  |  | |  | | --- | | 500 | |  |  |  |  |  |  | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | Потребности | |  | | --- | | 640 | | | |  | | --- | | 480 | | | |  | | --- | | 735 | | | |  | | --- | | 500 | | | |  | | --- | | 365 | | | |  | | --- | | 280 | | | |  | | --- | | 3000 | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |

В результате заполнения отмеченных клеток получен *условно оптимальный план*.

После получения условно оптимального плана определяем избыточные и недостаточные строки.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Пункты  отправления | Пункты назначения | | | | | | | | | | | | Запасы | Недостаток (−),  избыток (+) | | *B*1 | | *B*2 | | *B*3 | | *B*4 | | *B*5 | | *B*6 | | | *A*1 | |  | | --- | | 47 | |  | |  | | --- | | 59 | |  | |  |  | | --- | --- | | |  | | --- | | 41 | | |  | |  |  | | --- | --- | | |  | | --- | | 51 | | |  | |  |  | | --- | --- | | |  | | --- | | 39 | | |  | |  | | --- | | 14 | |  | |  | | --- | | 1000 | | |  |  |  | | --- | --- | --- | |  | |  | | --- | | 0 | | | |  |  |  |  |  | |  | | --- | | 235 | |  | |  | | --- | | 440 | |  | |  | | --- | | 325 | |  |  | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | *A*2 | |  |  | | --- | --- | | |  | | --- | | 19 | | |  | |  | | --- | | 59 | |  | |  | | --- | | 45 | |  | |  |  | | --- | --- | | |  | | --- | | 51 | | |  | |  | | --- | | 47 | |  | |  | | --- | | 2 | |  | |  | | --- | | 700 | | |  |  |  | | --- | --- | --- | |  | |  | | --- | | 0 | | | |  | |  | | --- | | 640 | |  |  |  |  |  | |  | | --- | | 60 | |  |  |  |  | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | *A*3 | |  | | --- | | 41 | |  | |  |  | | --- | --- | | |  | | --- | | 39 | | |  | |  | | --- | | 51 | |  | |  | | --- | | 53 | |  | |  |  | | --- | --- | | |  | | --- | | 39 | | |  | |  |  | | --- | --- | | |  | | --- | | 0 | | |  | |  | | --- | | 800 | | |  |  |  | | --- | --- | --- | |  | |  | | --- | | 0 | | | |  |  |  | |  | | --- | | 480 | |  |  |  |  |  | |  | | --- | | 40 | |  | |  | | --- | | 280 | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | *A*4 | |  | | --- | | 39 | |  | |  | | --- | | 43 | |  | |  |  | | --- | --- | | |  | | --- | | 41 | | |  | |  | | --- | | 57 | |  | |  | | --- | | 59 | |  | |  | | --- | | 16 | |  | |  | | --- | | 500 | | |  |  |  | | --- | --- | --- | |  | |  | | --- | | 0 | | | |  |  |  |  |  | |  | | --- | | 500 | |  |  |  |  |  |  | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | Потребности | |  | | --- | | 640 | | | |  | | --- | | 480 | | | |  | | --- | | 735 | | | |  | | --- | | 500 | | | |  | | --- | | 365 | | | |  | | --- | | 280 | | | |  | | --- | | 3000 | |  | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | |  | | --- | | 0 | |  |  | | | |

* Нераспределенный остаток равен 0.
* Суммарный объем поставок равен 3000.

Все имеющие запасы распределены в соответствии фактическими потребностями пунктов назначения. Следовательно, получен оптимальный план.

Оптимальный план имеет следующий вид:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | *С=* |  | |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | 235 | | |  | | --- | | 440 | | |  | | --- | | 325 | | |  | | --- | | 0 | | | |  | | --- | | 640 | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | 60 | | |  | | --- | | 0 | | |  | | --- | | 0 | | | |  | | --- | | 0 | | |  | | --- | | 480 | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | 40 | | |  | | --- | | 280 | | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | 500 | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | |

При этом плане стоимость перевозок вычисляется так:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *S=* | |  | | --- | | 27 | | · | |  | | --- | | 235 | | + | |  | | --- | | 37 | | · | |  | | --- | | 440 | | + | |  | | --- | | 25 | | · | |  | | --- | | 325 | | + | |  | | --- | | 17 | | · | |  | | --- | | 640 | | + | |  | | --- | | 49 | | · | |  | | --- | | 60 | | + | |  | | --- | | 39 | | · | |  | | --- | | 480 | | + | |  | | --- | | 39 | | · | |  | | --- | | 40 | | + | |  | | --- | | 0 | | · | |  | | --- | | 280 | | + | |  | | --- | | 25 | | · | |  | | --- | | 500 | | = | |  | | --- | | 77350 | |