**Лабораторная работа 3. Метод ветвей и границ. Задача коммивояжера и методы её решения.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Город** | **1** | **2** | **3** | **4** | **5** |
| **1** |  | 2 \* 7 = 14 | 21 + 7 = 28 |  | 7 |
| **2** | 7 |  | 15 + 7 = 22 | 68 - 7 = 61 | 84 - 7 = 77 |
| **3** | 2 + 7 = 9 | 3 \* 7 = 21 |  | 86 | 49 + 7 = 56 |
| **4** | 17 + 7 = 24 | 58 - 7 = 51 | 4 \* 7 = 28 |  | 3 \* 7 = 21 |
| **5** | 93 - 7 = 86 | 66 + 7 = 73 | 52 | 13 + 7 = 20 |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Город** | **1** | **2** | **3** | **4** | **5** |  |
| **1** |  | 14 | 28 |  | 7 | -7 |
| **2** | 7 |  | 22 | 61 | 77 | -7 |
| **3** | 9 | 21 |  | 86 | 56 | -9 |
| **4** | 24 | 51 | 28 |  | 21 | -21 |
| **5** | 86 | 73 | 52 | 20 |  | *-20* |
|  |  |  |  |  |  | ***64*** |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Город** | **1** | **2** | **3** | **4** | **5** |  |
| **1** |  | 7 | 21 |  | 0 |  |
| **2** | 0 |  | 15 | 54 | 70 |  |
| **3** | 0 | 13 |  | 77 | 47 |  |
| **4** | 3 | 30 | 7 |  | 0 |  |
| **5** | 66 | 53 | 32 | 0 |  |  |
|  | 0 | -7 | -7 | 0 | 0 | ***14*** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Город** | **1** | **2** | **3** | **4** | **5** |
| **1** |  | 0 | 14 |  | 0 |
| **2** | 0 |  | 8 | 54 | 70 |
| **3** | 0 | 5 |  | 77 | 47 |
| **4** | 3 | 23 | 0 |  | 0 |
| **5** | 66 | 46 | 25 | 0 |  |

64 + 14 = 78 - сумма констант приведения нижняя граница длины кратчайшего кольцевого маршута

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Город** | **1** | **2** | **3** | **4** | **5** |
| **1** |  | 0 | 14 |  | 0 |
| **2** | 0 |  | 8 | 54 | 70 |
| **3** | 0 | 5 |  | 77 | 47 |
| **4** | 3 | 23 | 0 |  | 0 |
| **5** | 66 | 46 | 25 | 0 |  |

Находим дугу которая максимально сильно можт повлиять на нижнюю границу

1)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Город** | **1** | **2** | **3** | **4** | **5** |  |
| **1** |  | *INF* | 14 |  | 0 | 0 |
| **2** | 0 |  | 8 | 54 | 70 |  |
| **3** | 0 | 5 |  | 77 | 47 |  |
| **4** | 3 | 23 | 0 |  | 0 |  |
| **5** | 66 | 46 | 25 | 0 |  |  |
|  |  | 5 |  |  |  | ***5*** |

2)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Город** | **1** | **2** | **3** | **4** | **5** |  |
| **1** |  | 0 | 14 |  | *INF* | 0 |
| **2** | 0 |  | 8 | 54 | 70 |  |
| **3** | 0 | 5 |  | 77 | 47 |  |
| **4** | 3 | 23 | 0 |  | 0 |  |
| **5** | 66 | 46 | 25 | 0 |  |  |
|  |  |  |  |  | 0 | ***0*** |

3)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Город** | **1** | **2** | **3** | **4** | **5** |  |
| **1** |  | 0 | 14 |  | 0 |  |
| **2** | *INF* |  | 8 | 54 | 70 | 8 |
| **3** | 0 | 5 |  | 77 | 47 |  |
| **4** | 3 | 23 | 0 |  | 0 |  |
| **5** | 66 | 46 | 25 | 0 |  |  |
|  | 0 |  |  |  |  | ***8*** |

4)

5)

6)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Город** | **1** | **2** | **3** | **4** | **5** |  |
| **1** |  | 0 | 14 |  | 0 |  |
| **2** | 0 |  | 8 | 54 | 70 |  |
| **3** | INF | 5 |  | 77 | 47 | 5 |
| **4** | 3 | 23 | 0 |  | 0 |  |
| **5** | 66 | 46 | 25 | 0 |  |  |
|  | 0 |  |  |  |  | ***5*** |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Город** | **1** | **2** | **3** | **4** | **5** |  |
| **1** |  | 0 | 14 |  | 0 |  |
| **2** | 0 |  | 8 | 54 | 70 |  |
| **3** | 0 | 5 |  | 77 | 47 |  |
| **4** | 3 | 23 | *INF* |  | 0 | 0 |
| **5** | 66 | 46 | 25 | 0 |  |  |
|  |  |  | 8 |  |  | ***8*** |

7)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Город** | **1** | **2** | **3** | **4** | **5** |  |
| **1** |  | 0 | 14 |  | 0 |  |
| **2** | 0 |  | 8 | 54 | 70 |  |
| **3** | 0 | 5 |  | 77 | 47 |  |
| **4** | 3 | 23 | 0 |  | *INF* | 0 |
| **5** | 66 | 46 | 25 | 0 |  |  |
|  |  |  |  |  | 0 | ***0*** |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Город** | **1** | **2** | **3** | **4** | **5** |  |
| **1** |  | 0 | 14 |  | 0 |  |
| **2** | 0 |  | 8 | 54 | 70 |  |
| **3** | 0 | 5 |  | 77 | 47 |  |
| **4** | 3 | 23 | 0 |  | 0 |  |
| **5** | 66 | 46 | 25 | *INF* |  | 25 |
|  |  |  |  | 54 |  | ***79*** |

Удаление дуги (5,4) позволяет получить самую большую сумму констант приведения 79 что даст самое большое увеличение нижней границы  
(5, 4) (4, 5)

R  
78

R  
78

R  
78

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Город** | **1** | **2** | **3** | **4** | **5** |  |
| **1** |  | 0 | 14 |  | 0 |  |
| **2** | 0 |  | 8 | 54 | 70 |  |
| **3** | 0 | 5 |  | 77 | 47 |  |
| **4** | 3 | 23 | 0 |  | INF | 0 |
| **5** | 66 | 46 | 25 | *INF* |  |  |
|  |  |  |  |  | 0 | ***0*** |

R(5,4)  
78+0

R(не(5,4))  
78+79

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Город** | **1** | **2** | **3** | **5** |  |
| **1** |  | 0 | 14 | INF | 0 |
| **2** | 0 |  | 8 | 70 |  |
| **3** | 0 | 5 |  | 47 |  |
| **4** | 3 | 23 | 0 | INF |  |
|  |  |  |  | 47 | *47* |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Город** | **1** | **2** | **3** |  |
| **2** | 0 |  | 8 | 0 |
| **3** | 0 | 5 |  | 0 |
| **4** | 3 | 23 | 0 | 0 |
|  | 0 | 5 | 0 | 5 |

А) Удаление дуги (1,5) позволяет получить самую большую сумму констант приведения 47 верхняя граница

С) вычеркиваем (1,5)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Город** | **1** | **2** | **3** |  |
| **2** | 0 |  | 8 | 0 |
| **3** | 0 | 0 |  | 0 |
| **4** | 3 | 18 | 0 | 0 |
|  | 0 | 0 | 0 |  |

D) получем из таблицы С путем полного ее приведения.

R  
78

R(не(5,4))  
78+79

R(5,4)  
78+0

R(5,4)(5,1)  
78+47

R(5,4)(не5,1)  
78+5

А)Удаление дуги (4, 3) позволяет получить самую большую сумму констант приведения 47 верхняя граница

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Город** | **1** | **2** | **3** |  |
| **2** | 0 |  | 8 | 0 |
| **3** | 0 | 0 |  | 0 |
| **4** | 3 | 18 | INF | 3 |
|  | 0 | 0 | 8 | 11 |

1. Вычеркиваем (4,3) : Эта таблица не может быть приведена, т. е. сумма констант приведения будет равной 0.

|  |  |  |  |
| --- | --- | --- | --- |
| **Город** | **1** | **2** |  |
| **2** | 0 |  | 0 |
| **3** | 0 | 0 | 0 |
|  | 0 | 0 | 0 |

R  
78

R(не(5,4))  
78+79

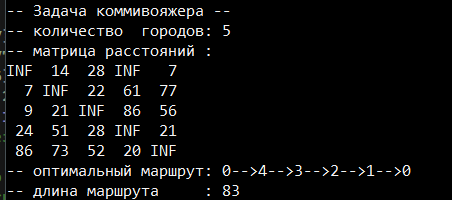
R(5,4)  
78+0

R(5,4)(5,1)  
78+47

R(5,4)(не5,1)  
78+5

R(5,4)(не5,1)(не 4,3)  
83+11

R(5,4)(не5,1)(4,3)  
83+0



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