**Задача коммивояжера**

**Сапожников В.О. 19-В-1**

**ВАРИАНТ 3**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **1** | **2** | **3** | **4** | **5** | **6** |
| **1** | — | 15 | 20 | 25 | 5 | 10 |
| **2** | 15 | — | 25 | 10 | 13 | 15 |
| **3** | 25 | 20 | — | 15 | 25 | 35 |
| **4** | 20 | 15 | 15 | — | 10 | 25 |
| **5** | 10 | 15 | 25 | 15 | — | 13 |
| **6** | 30 | 20 | 25 | 19 | 15 | — |

Приводим матрицу

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **1** | **2** | **3** | **4** | **5** | **6** | **min** |
| **1** | — | 15 | 20 | 25 | 5 | 10 | 5 |
| **2** | 15 | — | 25 | 10 | 13 | 15 | 10 |
| **3** | 25 | 20 | — | 15 | 25 | 35 | 15 |
| **4** | 20 | 15 | 15 | — | 10 | 25 | 10 |
| **5** | 10 | 15 | 25 | 15 | — | 13 | 10 |
| **6** | 30 | 20 | 25 | 19 | 15 | — | 15 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **1** | **2** | **3** | **4** | **5** | **6** |
| **1** | — | 10 | 15 | 20 | 0 | 5 |
| **2** | 5 | — | 15 | 0 | 3 | 5 |
| **3** | 10 | 5 | — | 0 | 10 | 20 |
| **4** | 10 | 5 | 5 | — | 0 | 15 |
| **5** | 0 | 5 | 15 | 5 | — | 3 |
| **6** | 15 | 5 | 10 | 4 | 0 | — |
| **min** | 0 | 5 | 5 | 0 | 0 | 3 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **1** | **2** | **3** | **4** | **5** | **6** |
| **1** | — | 5 | 10 | 20 | 0 | 2 |
| **2** | 5 | — | 10 | 0 | 3 | 2 |
| **3** | 10 | 0 | — | 0 | 10 | 17 |
| **4** | 10 | 0 | 0 | — | 0 | 12 |
| **5** | 0 | 0 | 10 | 5 | — | 0 |
| **6** | 15 | 0 | 5 | 4 | 0 | — |

H = H0 = 5 + 10 + 15 + 10 + 10 + 15 + 5 + 5 + 3 = **78**

**Расчет штрафов**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **1** | **2** | **3** | **4** | **5** | **6** |
| **1** | — | 5 | 10 | 20 | 0(2) | 2 |
| **2** | 5 | — | 10 | 0(2) | 3 | 2 |
| **3** | 10 | 0(0) | — | 0(0) | 10 | 17 |
| **4** | 10 | 0(0) | 0(5) | — | 0(0) | 12 |
| **5** | 0(5) | 0(0) | 10 | 5 | — | 0(2) |
| **6** | 15 | 0(0) | 5 | 4 | 0(0) | — |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **1** | **2** | **3** | **4** | **5** | **6** |
| **1** | — | 5 | 10 | 20 | 0(2) | 2 |
| **2** | 5 | — | 10 | 0(2) | 3 | 2 |
| **3** | 10 | 0(0) | — | 0(0) | 10 | 17 |
| **4** | 10 | 0(0) | 0(5) | — | 0(0) | 12 |
| **5** | 0(5) | 0(0) | 10 | 5 | — | 0(2) |
| **6** | 15 | 0(0) | 5 | 4 | 0(0) | — |



|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **2** | **3** | **4** | **5** | **6** | **min** |
| **1** | 5 | 10 | 20 | — | 2 | 2 |
| **2** | — | 10 | 0 | 3 | 2 | 0 |
| **3** | 0 | — | 0 | 10 | 17 | 0 |
| **4** | 0 | 0 | — | 0 | 12 | 0 |
| **6** | 0 | 5 | 4 | 0 | — | 0 |

Включая (5,1) = 78+5=83

**Исключая (5,1) = 78 + 2 = 80**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **2** | **3** | **4** | **5** | **6** |
| **1** | 3 | 8 | 18 | — | 0(5) |
| **2** | — | 10 | 0(2) | 3 | 2 |
| **3** | 0(0) | — | 0(0) | 10 | 17 |
| **4** | 0(0) | 0(5) | — | 0(0) | 12 |
| **6** | 0(0) | 5 | 4 | 0(0) | — |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **2** | **3** | **4** | **5** | **6** |
| **1** | 3 | 8 | 18 | — | 0(5) |
| **2** | — | 10 | 0(2) | 3 | 2 |
| **3** | 0(0) | — | 0(0) | 10 | 17 |
| **4** | 0(0) | 0(5) | — | 0(0) | 12 |
| **6** | 0(0) | 5 | 4 | 0(0) | — |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **2** | **3** | **4** | **5** |
| **2** | — | 10 | 0 | 3 |
| **3** | 0 | — | 0 | 10 |
| **4** | 0 | 0 | — | 0 |
| **6** | 0 | 5 | 4 | — |

Исключая (1,6) = 80+5=85

**Включая (1,6) = 80+ 0 = 80**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **2** | **3** | **4** | **5** |
| **2** | — | 10 | 0(3) | 3 |
| **3** | 0(0) | — | 0(0) | 10 |
| **4** | 0(0) | 0(5) | — | 0(3) |
| **6** | 0(4) | 5 | 4 | — |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **2** | **3** | **4** | **5** |
| **2** | — | 10 | 0(3) | 3 |
| **3** | 0(0) | — | 0(0) | 10 |
| **4** | 0(0) | 0(5) | — | 0(3) |
| **6** | 0(4) | 5 | 4 | — |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **2** | **4** | **5** |  |
| **2** | — | 0 | 3 |  |
| **3** | 0 | — | 10 |  |
| **6** | 0 | 4 | — |  |
|  | 0 | 0 | 3 | min |

Исключая (4,3) = 80+5=85

**Включая (4,3) = 80+ 3 = 83**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **2** | **4** | **5** |
| **2** | — | 0 | 0 |
| **3** | 0 | — | 7 |
| **6** | 0 | 4 | — |

|  |  |  |  |
| --- | --- | --- | --- |
|  | **2** | **4** | **5** |
| **2** | — | 0(4) | 0(7) |
| **3** | 0(7) | — | 7 |
| **6** | 0(4) | 4 | — |

|  |  |  |  |
| --- | --- | --- | --- |
|  | **2** | **4** | **5** |
| **2** | — | 0(4) | 0(7) |
| **3** | 0(7) | — | 7 |
| **6** | 0(4) | 4 | — |

|  |  |  |
| --- | --- | --- |
|  | **2** | **4** |
| **3** | 0 | — |
| **6** | — | 4 |

Исключая (2,5) = 83+7=90

**Включая (2,5) = 83+4 = 87 >** Исключая (4,3) = 80+5=85

**Вернемся назад и исключим (4,3)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **2** | **3** | **4** | **5** |
| **2** | — | 10 | 0 | 3 |
| **3** | 0 | — | 0 | 10 |
| **4** | 0 | — | — | 0 |
| **6** | 0 | 5 | 4 | — |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **2** | **3** | **4** | **5** |
| **2** | — | 10 | 0 | 3 |
| **3** | 0 | — | 0 | 10 |
| **4** | 0 | — | — | 0 |
| **6** | 0 | 5 | 4 | — |
| **min** | 0 | 5 | 0 | 0 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **2** | **3** | **4** | **5** |
| **2** | — | 5 | 0(3) | 3 |
| **3** | 0(0) | — | 0(0) | 10 |
| **4** | 0(0) | — | — | 0(3) |
| **6** | 0(0) | 0(5) | 4 | — |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **2** | **3** | **4** | **5** |
| **2** | — | 5 | 0(3) | 3 |
| **3** | 0(0) | — | 0(0) | 10 |
| **4** | 0(0) | — | — | 0(3) |
| **6** | 0(0) | 0(5) | 4 | — |

|  |  |  |  |
| --- | --- | --- | --- |
|  | **2** | **4** | **5** |
| **2** | — | 0 | 3 |
| **3** | 0 | 0 | — |
| **4** | 0 | — | 0 |

Исключая (6,3) = 85+5=90

**Включая (6,3) = 85+ 0 = 85**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **2** | **4** | **5** |
| **2** | — | 0(3) | 3 |
| **3** | 0(0) | 0(0) | — |
| **4** | 0(0) | — | 0(3) |

|  |  |  |  |
| --- | --- | --- | --- |
|  | **2** | **4** | **5** |
| **2** | — | 0(3) | 3 |
| **3** | 0(0) | 0(0) | — |
| **4** | 0(0) | — | 0(3) |

|  |  |  |
| --- | --- | --- |
|  | **2** | **5** |
| **3** | 0 | — |
| **4** | — | 0 |

Исключая (2,4) = 85+3=90

**Включая (2,4) = 85+ 0 = 85**

**Остались маршруты (3, 2) и (4, 5), которые не имеют штрафов**

|  |  |  |
| --- | --- | --- |
|  | **2** | **5** |
| **3** | 0 | — |
| **4** | — | 0 |

**Оптимальный маршрут:** (1, 6) (6, 3) (3,2) (2, 4) (4, 5) (5, 1) = 10 + 25 +20 + + 10 + 10 + 10 = **85**

