Отчёт по лабораторной работе №5. **ТРАНСПОРТНАЯ ЗАДАЧА**

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***Исходное условие*:**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ПОТРЕБИТЕЛИ  ПОСТАВЩИКИ | 1 | 2 | 3 | 4 | 5 | 6 | ЗАПАСЫ |
| 1 | **N+12** | **N+2** | **N+6** | **N+3** | **N+11** | **N+1** | **168+N** |
| 2 | **N+10** | **N** | **N+8** | **N+5** | **N+7** | **N+13** | **113+N** |
| 3 | **N+1** | **N+5** | **N+11** | **N+8** | **N+2** | **N+11** | **150+N** |
| 4 | **N+4** | **N+10** | **N+10** | **N+3** | **N+13** | **N+2** | **159+N** |
| 5 | **N+3** | **N+11** | **N+9** | **N** | **N+10** | **N+4** | **100+N** |
| ПОТРЕБНОСТИ | **143+N** | **107+N** | **131+N** | **193+N** | **95+N** | **163+N** |  |

***Согласно варианту при N = 13:***

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ПОТРЕБИТЕЛИ  ПОСТАВЩИКИ | 1 | 2 | 3 | 4 | 5 | 6 | ЗАПАСЫ |
| 1 | **25** | **15** | **19** | **16** | **24** | **14** | **181** |
| 2 | **23** | **13** | **21** | **18** | **20** | **26** | **126** |
| 3 | **14** | **18** | **24** | **21** | **15** | **24** | **163** |
| 4 | **17** | **23** | **23** | **16** | **26** | **15** | **172** |
| 5 | **16** | **24** | **22** | **13** | **23** | **17** | **113** |
| ПОТРЕБНОСТИ | **156** | **120** | **144** | **206** | **108** | **179** |  |

***Ход решения:***

*Должно быть:* m+n-1=5+6-1 = 10 переменных

1. Выбор ячейки с наименьшим значением x2,2= min{120,126} = 120

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ПОТРЕБИТЕЛИ  ПОСТАВЩИКИ | 1 | 2 | 3 | 4 | 5 | 6 | ЗАПАСЫ |
| 1 | **25** | **15** | **19** | **16** | **24** | **14** | **181** |
| 2 | **23** | **13 | 120** | **21** | **18** | **20** | **26** | **6** |
| 3 | **14** | **18** | **24** | **21** | **15** | **24** | **163** |
| 4 | **17** | **23** | **23** | **16** | **26** | **15** | **172** |
| 5 | **16** | **24** | **22** | **13** | **23** | **17** | **113** |
| ПОТРЕБНОСТИ | **156** | **0** | **144** | **206** | **108** | **179** |  |

1. Выбор ячейки с наименьшим значением x5,4= min{113,206} = 113

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ПОТРЕБИТЕЛИ  ПОСТАВЩИКИ | 1 | 2 | 3 | 4 | 5 | 6 | ЗАПАСЫ |
| 1 | **25** | **15** | **19** | **16** | **24** | **14** | **181** |
| 2 | **23** | **13 | 120** | **21** | **18** | **20** | **26** | **6** |
| 3 | **14** | **18** | **24** | **21** | **15** | **24** | **163** |
| 4 | **17** | **23** | **23** | **16** | **26** | **15** | **172** |
| 5 | **16** | **24** | **22** | **13 | 113** | **23** | **17** | **0** |
| ПОТРЕБНОСТИ | **156** | **0** | **144** | **93** | **108** | **179** |  |

1. Выбор ячейки с наименьшим значением x1,6= min{181,179} = 179

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ПОТРЕБИТЕЛИ  ПОСТАВЩИКИ | 1 | 2 | 3 | 4 | 5 | 6 | ЗАПАСЫ |
| 1 | **25** | **15** | **19** | **16** | **24** | **14 | 179** | **2** |
| 2 | **23** | **13 | 120** | **21** | **18** | **20** | **26** | **6** |
| 3 | **14** | **18** | **24** | **21** | **15** | **24** | **163** |
| 4 | **17** | **23** | **23** | **16** | **26** | **15** | **172** |
| 5 | **16** | **24** | **22** | **13 | 113** | **23** | **17** | **0** |
| ПОТРЕБНОСТИ | **156** | **0** | **144** | **93** | **108** | **0** |  |

1. Выбор ячейки с наименьшим значением x1,3= min{163,156} = 156

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ПОТРЕБИТЕЛИ  ПОСТАВЩИКИ | 1 | 2 | 3 | 4 | 5 | 6 | ЗАПАСЫ |
| 1 | **25** | **15** | **19** | **16** | **24** | **14 | 179** | **2** |
| 2 | **23** | **13 | 120** | **21** | **18** | **20** | **26** | **6** |
| 3 | **14 | 156** | **18** | **24** | **21** | **15** | **24** | **7** |
| 4 | **17** | **23** | **23** | **16** | **26** | **15** | **172** |
| 5 | **16** | **24** | **22** | **13 | 113** | **23** | **17** | **0** |
| ПОТРЕБНОСТИ | **0** | **0** | **144** | **93** | **108** | **0** |  |

1. Выбор ячейки с наименьшим значением x3,5= min{7,108} = 7

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ПОТРЕБИТЕЛИ  ПОСТАВЩИКИ | 1 | 2 | 3 | 4 | 5 | 6 | ЗАПАСЫ |
| 1 | **25** | **15** | **19** | **16** | **24** | **14 | 179** | **2** |
| 2 | **23** | **13 | 120** | **21** | **18** | **20** | **26** | **6** |
| 3 | **14 | 156** | **18** | **24** | **21** | **15** | **24** | **0** |
| 4 | **17** | **23** | **23** | **16** | **26** | **15** | **172** |
| 5 | **16** | **24** | **22** | **13 | 113** | **23** | **17** | **0** |
| ПОТРЕБНОСТИ | **0** | **0** | **144** | **93** | **101** | **0** |  |

1. Выбор ячейки с наименьшим значением x4,4= min{172,93} = 93

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ПОТРЕБИТЕЛИ  ПОСТАВЩИКИ | 1 | 2 | 3 | 4 | 5 | 6 | ЗАПАСЫ |
| 1 | **25** | **15** | **19** | **16** | **24** | **14 | 179** | **2** |
| 2 | **23** | **13 | 120** | **21** | **18** | **20** | **26** | **6** |
| 3 | **14 | 156** | **18** | **24** | **21** | **15 | 7** | **24** | **0** |
| 4 | **17** | **23** | **23** | **16 | 93** | **26** | **15** | **79** |
| 5 | **16** | **24** | **22** | **13 | 113** | **23** | **17** | **0** |
| ПОТРЕБНОСТИ | **0** | **0** | **144** | **0** | **101** | **0** |  |

1. Выбор ячейки с наименьшим значением x1,3= min{2,144} = 2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ПОТРЕБИТЕЛИ  ПОСТАВЩИКИ | 1 | 2 | 3 | 4 | 5 | 6 | ЗАПАСЫ |
| 1 | **25** | **15** | **19 | 2** | **16** | **24** | **14 | 179** | **0** |
| 2 | **23** | **13 | 120** | **21** | **18** | **20** | **26** | **6** |
| 3 | **14 | 156** | **18** | **24** | **21** | **15 | 7** | **24** | **0** |
| 4 | **17** | **23** | **23** | **16 | 93** | **26** | **15** | **79** |
| 5 | **16** | **24** | **22** | **13 | 113** | **23** | **17** | **0** |
| ПОТРЕБНОСТИ | **0** | **0** | **142** | **0** | **101** | **0** |  |

1. Выбор ячейки с наименьшим значением x2,5= min{6,101} = 6

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ПОТРЕБИТЕЛИ  ПОСТАВЩИКИ | 1 | 2 | 3 | 4 | 5 | 6 | ЗАПАСЫ |
| 1 | **25** | **15** | **19 | 2** | **16** | **24** | **14 | 179** | **0** |
| 2 | **23** | **13 | 120** | **21** | **18** | **20 | 6** | **26** | **0** |
| 3 | **14 | 156** | **18** | **24** | **21** | **15 | 7** | **24** | **0** |
| 4 | **17** | **23** | **23** | **16 | 93** | **26** | **15** | **79** |
| 5 | **16** | **24** | **22** | **13 | 113** | **23** | **17** | **0** |
| ПОТРЕБНОСТИ | **0** | **0** | **142** | **0** | **95** | **0** |  |

1. Выбор ячейки с наименьшим значением x6,5= min{95,158} = 95

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ПОТРЕБИТЕЛИ  ПОСТАВЩИКИ | 1 | 2 | 3 | 4 | 5 | 6 | ЗАПАСЫ |
| 1 | **25** | **15** | **19 | 2** | **16** | **24** | **14 | 179** | **0** |
| 2 | **23** | **13 | 120** | **21** | **18** | **20 | 6** | **26** | **0** |
| 3 | **14 | 156** | **18** | **24** | **21** | **15 | 7** | **24** | **0** |
| 4 | **17** | **23** | **23 | 79** | **16 | 93** | **26** | **15** | **0** |
| 5 | **16** | **24** | **22** | **13 | 113** | **23** | **17** | **0** |
| 6 | **0** | **0** | **0** | **0** | **0 | 95** | **0** | **63** |
| ПОТРЕБНОСТИ | **0** | **0** | **63** | **0** | **0** | **0** |  |

10)Выбор ячейки с наименьшим значением x6,3= min{63,63} = 63

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ПОТРЕБИТЕЛИ  ПОСТАВЩИКИ | 1 | 2 | 3 | 4 | 5 | 6 | ЗАПАСЫ |
| 1 | **25** | **15** | **19 | 2** | **16** | **24** | **14 | 179** | **0** |
| 2 | **23** | **13 | 120** | **21** | **18** | **20 | 6** | **26** | **0** |
| 3 | **14 | 156** | **18** | **24** | **21** | **15 | 7** | **24** | **0** |
| 4 | **17** | **23** | **23 | 79** | **16 | 93** | **26** | **15** | **0** |
| 5 | **16** | **24** | **22** | **13 | 113** | **23** | **17** | **0** |
| 6 | **0** | **0** | **0 | 63** | **0** | **0 | 95** | **0** | **0** |
| ПОТРЕБНОСТИ | **0** | **0** | **0** | **0** | **0** | **0** |  |

Z = 2\*19 + 179\*14 + 120\*13 + 6\*20 + 156\*14 + 7\*15 + 79\*23 + 93\*16 + 113\*13 + 63\*0 + 95\*0 = 11287

***Проверка оптимальности на методе потенциалов:***

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ПОТРЕБИТЕЛИ  ПОСТАВЩИКИ | 1 | 2 | 3 | 4 | 5 | 6 | ЗАПАСЫ |
| 1 | **25** | **15** | **19 | 2** | **16** | **24** | **14 | 179** | **0** |
| 2 | **23** | **13 | 120** | **21** | **18** | **20 | 6** | **26** | **0** |
| 3 | **14 | 156** | **18** | **24** | **21** | **15 | 7** | **24** | **0** |
| 4 | **17** | **23** | **23 | 79** | **16 | 93** | **26** | **15** | **0** |
| 5 | **16** | **24** | **22** | **13 | 113** | **23** | **17** | **0** |
| 6 | **0** | **0** | **0 | 63** | **0** | **0 | 95** | **0** | **0** |
| ПОТРЕБНОСТИ | **0** | **0** | **0** | **0** | **0** | **0** |  |

***Определяем потенциалы для всех базисных переменных:***

***x1,3 : v3 + u1 = 19 v3 = 19 - 0 = 19***

***x1,6: v6 + u1 = 14 v6 = 14 - 0 = 14***

***x4,3 : v3 + u4 = 23 u4 = 23 - 19 = 4***

***x4,4 : v4 + u4 = 16 v4 = 16 - 4 = 12***

***x5,4 : v4 + u5 = 13 u5 = 13 - 12 = 1***

***x6,3 : v3 + u6 = 0 u6 = 0 - 19 = -19***

***x6,5: v5 + u6 = 0 v5 = 0 - (-19) = 19***

***x2,5 : v5 + u2 = 20 u2 = 20 - 19 = 1***

***x3,5 : v5 + u3 = 15 u3 = 15 - 19 = -4***

***x2,2 : v2 + u2 = 13 v2 = 13 - 1 = 12***

***x3,1: v1 + u3 = 14 v1 = 14 - (-4) = 18***

***Для свободных клеток:***

*x1,1: Δ11 = c11 - ( u1 + v1 ) = 25 - ( 0 + 18 ) = 7*

*x1,2: Δ12 = c12 - ( u1 + v2 ) = 15 - ( 0 + 12 ) = 3*

*x1,4: Δ14 = c14 - ( u1 + v4 ) = 16 - ( 0 + 12 ) = 4*

*x1,5 : Δ15 = c15 - ( u1 + v5 ) = 24 - ( 0 + 19 ) = 5*

*x2,1: Δ21 = c21 - ( u2 + v1 ) = 23 - ( 1 + 18 ) = 4*

*x2,3: Δ23 = c23 - ( u2 + v3 ) = 21 - ( 1 + 19 ) = 1*

*x2,4 : Δ24 = c24 - ( u2 + v4 ) = 18 - ( 1 + 12 ) = 5*

*x2,6: Δ26 = c26 - ( u2 + v6 ) = 26 - ( 1 + 14 ) = 11*

*x3,2: Δ32 = c32 - ( u3 + v2 ) = 18 - ( -4 + 12 ) = 10*

*x3,3 : Δ33 = c33 - ( u3 + v3 ) = 24 - ( -4 + 19 ) = 9*

*x3,4: Δ34 = c34 - ( u3 + v4 ) = 21 - ( -4 + 12 ) = 13*

*x3,6: Δ36 = c36 - ( u3 + v6 ) = 24 - ( -4 + 14 ) = 14*

*x4,1: Δ41 = c41 - ( u4 + v1 ) = 17 - ( 4 + 18 ) = -5*

*x4,2: Δ42 = c42 - ( u4 + v2 ) = 23 - ( 4 + 12 ) = 7*

*x4,5: Δ45 = c45 - ( u4 + v5 ) = 26 - ( 4 + 19 ) = 3*

*x4,6: Δ46 = c46 - ( u4 + v6 ) = 15 - ( 4 + 14 ) = -3*

*x5,1: Δ51 = c51 - ( u5 + v1 ) = 16 - ( 1 + 18 ) = -3*

*x5,2: Δ52 = c52 - ( u5 + v2 ) = 24 - ( 1 + 12 ) = 11*

*x5,3: Δ53 = c53 - ( u5 + v3 ) = 22 - ( 1 + 19 ) = 2*

*x5,5: Δ55 = c55 - ( u5 + v5 ) = 23 - ( 1 + 19 ) = 3*

*x5,6: Δ56 = c56 - ( u5 + v6 ) = 17 - ( 1 + 14 ) = 2*

*x6,1: Δ61 = c61 - ( u6 + v1 ) = 0 - ( -19 + 18 ) = 1*

*x6,2: Δ62 = c62 - ( u6 + v2 ) = 0 - ( -19 + 12 ) = 7*

*x6,4: Δ64 = c64 - ( u6 + v4 ) = 0 - ( -19 + 12 ) = 7*

*x6,6: Δ66 = c66 - ( u6 + v6 ) = 0 - ( -19 + 14 ) = 5*

*Выбор свободной ячейки с самой маленькой оценкой – x4,1*

***Матрица обхода:***

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ПОТРЕБИТЕЛИ  ПОСТАВЩИКИ | 1 | 2 | 3 | 4 | 5 | 6 | ЗАПАСЫ |
| 1 | **25** | **15** | **19 | 2** | **16** | **24** | **14 | 179** | **181** |
| 2 | **23** | **13 | 120** | **21** | **18** | **20 | 6** | **26** | **126** |
| 3 | **14 | 156** | **18** | **24** | **21** | **15 | 7** | **24** | **163** |
| 4 | **17 | -5** | **23** | **23 | 79** | **16 | 93** | **26** | **15** | **172** |
| 5 | **16** | **24** | **22** | **13 | 113** | **23** | **17** | **113** |
| 6 | **0** | **0** | **0 | 63** | **0** | **0 | 95** | **0** | **158** |
| ПОТРЕБНОСТИ | **156** | **120** | **144** | **206** | **108** | **179** |  |

***x4,1 =* Δ41 \* 79 = -395**

***Общая сумма доставки:***

***Z = 11287 - 395 = 10892***