МИНИСТЕРСТВО ОБРАЗОВАНИЯ РЕСПУБЛИКИ БЕЛАРУСЬ

БЕЛОРУССКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ

ФАКУЛЬТЕТ ПРИКЛАДНОЙ МАТЕМАТИКИ И ИНФОРМАТИКИ

Лабораторная работа 3

Выполнил:

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3 курс 3 группа

Преподаватель:

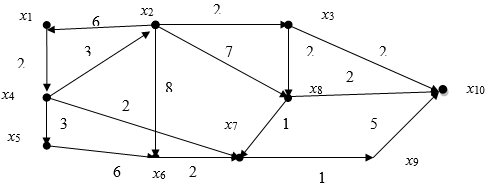
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Минск

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## 1.a Алгоритм Дейкстры

### Условие



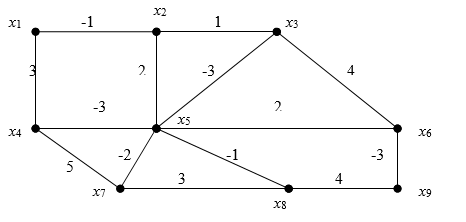
### Решение

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |
| (0, )\* | (inf, ) | (inf, ) | (inf, ) | (inf, ) | (inf, ) | (inf, ) | (inf, ) | (inf, ) | (inf, ) |
|  | (inf, ) | (inf, ) | (2, ) | (inf, ) | (inf, ) | (inf, ) | (inf, ) | (inf, ) | (inf, ) |
|  | (5, ) | (inf, ) | (2, )\* | (5, ) | (inf, ) | (4, ) | (inf, ) | (inf, ) | (inf, ) |
|  | (5, ) | (inf, ) |  | (5, ) | (inf, ) | (4, )\* | (inf, ) | (5, ) | (inf, ) |
|  | (5, )\* | (7, ) |  | (5, ) | (13, ) |  | (12, ) | (5, ) | (inf, ) |
|  |  | (7, ) |  | (5, )\* | (11, ) |  | (12, ) | (5, ) | (inf, ) |
|  |  | (7, ) |  |  | (11, ) |  | (12, ) | (5, )\* | (10, ) |
|  |  | (7, )\* |  |  | (11, ) |  | (9, ) |  | (9, ) |
|  |  |  |  |  | (11, ) |  | (9, )\* |  | (9, ) |
|  |  |  |  |  | (11, ) |  |  |  | (9, ) \* |
|  |  |  |  |  | (11, ) \* |  |  |  |  |

### Кратчайший путь

## 2.b Алгоритм Форда-Беллмана

### Условие



### Матрица расстояний

Сделаем граф ориентированным, как приведено ниже

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | -1 | inf | 3 | inf | inf | inf | inf | inf |
| inf | 0 | 1 | inf | inf | inf | inf | inf | inf |
| inf | inf | 0 | inf | inf | 4 | inf | inf | inf |
| inf | inf | inf | 0 | -3 | inf | 5 | inf | inf |
| inf | 2 | -3 | inf | 0 | 2 | inf | -1 | inf |
| inf | inf | inf | inf | inf | 0 | inf | inf | inf |
| inf | inf | inf | inf | -2 | inf | 0 | 3 | inf |
| inf | inf | inf | inf | inf | inf | inf | 0 | 4 |
| inf | inf | inf | inf | inf | -3 | inf | inf | 0 |

### Алгоритм

for k in range(1, 10):

for i in range(9):

previous = l[i][0]

minimum = i

for j in range(9):

if l[i][0] > l[j][0] + d[j][i]:

l[i][0] = l[j][0] + d[j][i]

minimum = j

if l[i][0] != previous and k + 1 is not 10:

l[i][1] = minimum

### Итерации

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| (0, ) | (-1, ) | (inf, ) | (3, ) | (inf, ) | (inf, ) | (inf, ) | (inf, ) | (inf, ) |
| (0, ) | (-1, ) | (0, ) | (3, ) | (0, ) | (2, ) | (8, ) | (-1, ) | (3, ) |
| (0, ) | (-1, ) | (0, ) | (-3, ) | (0, ) | (0, ) | (8, ) | (-1, ) | (3, ) |
| (0, ) | (-1, ) | (0, ) | (-3, ) | (0, ) | (0, ) | (8, ) | (-1, ) | (3, ) |

### Кратчайший путь

## 4.b Алгоритм Флойда

### Алгоритм

for k in range(6):

for i in range(6):

for j in range(6):

if i is not j and i is not k and j is not k:

if d[i][k] + d[k][j] < d[i][j]:

d[i][j] = d[i][k] + d[k][j]

t[i][j] = k + 1

### Выполнение

|  |  |  |
| --- | --- | --- |
| **Итерация** | **D** | **T** |
| 0 | 0 11 2 8 11 11  11 0 5 inf inf 1  inf 5 0 inf 2 1  2 inf inf 0 2 inf  inf 9 inf 2 0 7  inf 1 inf inf 7 0 | 0 2 3 4 5 6  1 0 3 4 5 6  1 2 0 4 5 6  1 2 3 0 5 6  1 2 3 4 0 6  1 2 3 4 5 0 |
| 1 | 0 11 2 8 11 11  11 0 5 19 22 1  inf 5 0 inf 2 1  2 13 4 0 2 13  inf 9 inf 2 0 7  inf 1 inf inf 7 0 | 0 2 3 4 5 6  1 0 3 1 1 6  1 2 0 4 5 6  1 1 1 0 5 1  1 2 3 4 0 6  1 2 3 4 5 0 |
| 2 | 0 11 2 8 11 11  11 0 5 19 22 1  16 5 0 24 2 1  2 13 4 0 2 13  20 9 14 2 0 7  12 1 6 20 7 0 | 0 2 3 4 5 6  1 0 3 1 1 6  2 2 0 2 5 6  1 1 1 0 5 1  2 2 2 4 0 6  2 2 2 2 5 0 |
| 3 | 0 7 2 8 4 3  11 0 5 19 7 1  16 5 0 24 2 1  2 9 4 0 2 5  20 9 14 2 0 7  12 1 6 20 7 0 | 0 3 3 4 3 3  1 0 3 1 3 6  2 2 0 2 5 6  1 3 1 0 5 3  2 2 2 4 0 6  2 2 2 2 5 0 |
| 4 | 0 7 2 8 4 3  11 0 5 19 7 1  16 5 0 24 2 1  2 9 4 0 2 5  4 9 6 2 0 7  12 1 6 20 7 0 | 0 3 3 4 3 3  1 0 3 1 3 6  2 2 0 2 5 6  1 3 1 0 5 3  4 2 4 4 0 6  2 2 2 2 5 0 |
| 5 | 0 7 2 6 4 3  11 0 5 9 7 1  6 5 0 4 2 1  2 9 4 0 2 5  4 9 6 2 0 7  11 1 6 9 7 0 | 0 3 3 5 3 3  1 0 3 5 3 6  5 2 0 5 5 6  1 3 1 0 5 3  4 2 4 4 0 6  5 2 2 5 5 0 |
| 6 | 0 4 2 6 4 3  11 0 5 9 7 1  6 2 0 4 2 1  2 6 4 0 2 5  4 8 6 2 0 7  11 1 6 9 7 0 | 0 6 3 5 3 3  1 0 3 5 3 6  5 6 0 5 5 6  1 6 1 0 5 3  4 6 4 4 0 6  5 2 2 5 5 0 |