UE19CS251 DAA
Assignment II
Max Marks: 20(will be scaled down)

Implement Dijkstra's algorithm to solve **Single Destination Shortest Path** problem. Single destination shortest path is finding shortest path from all the vertices to the given vertex

Input graph to be read from the file adjacencylist.txt

Input file

- Vertices are numbered 1 to n
- First line represents number of vertices
- This is followed by a set of lines
- Each line starts with a integer (any integer from 1 to n in any order) which represents vertex number (v_id) followed by space followed by a set of d pairs where d represents outdegree of the vertex v_id .First number in the pair represents neighbour vertex id and second number weight of the edge which connects vertex to the neighbour. Weight is always a non-negative integer

  Sample Input file

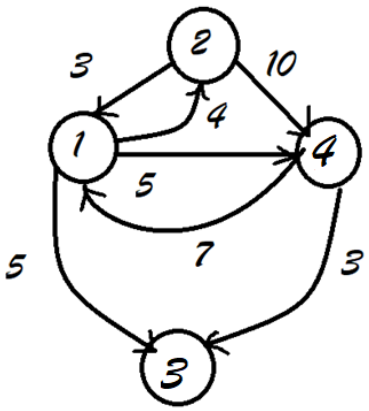
  4

  1 2 4 3 5 4 5

  4 1 7 3 3

  2 1 3 4 10

  Represents the graph



The input file provided in the assignment folder should be read to create a graph which should be represented in memory using **adjacency list representation**

Implementation

- Program should consider the last vertex (v_id =n)as the destination

  (Example destination is 4 for the graph mentioned in example above)

- Using Dijkstra's algorithm Program should determine shortest distance from all the vertices to the destination
- Priority queue used by dijkstra's algorithm should be implemented using min heap. Each node in the heap contains vertex number, d value (distance of path from source to the vertex), and p value (Vertex id of predecessor vertex on the path from the source to the vertex). d value should be used as key to perform various operations (insert/delete/update)
- Program should print shortest path from all the vertices to the destination.

Output Format

- Each paths to be printed on new line (starting with path from 1 to destination then from 2,3---------n-1).If no path exists from a particular vertex to the destination vertex 'NO PATH' should be printed on the respective line number
- Each line should print a single path and length of the path (space separated), where the vertices in a path are space separated (No other format for output is accepted)

  Sample output:

  1 1 4 5

  2 2 1 4 8

  3 NO PATH

C programming language should be used for implementation

Implementation should consists of three files

- Header file (function prototypes, user defined data type definitions)
- Implementation File (function definitions)
- Client file (Driver function)

The file names should be

SRN_H.h

SRN_F.c

SRN_C.c

List of functionalities your code should support

1. Reading data from file and creating Graph
   (Adjacency list and not adjacency matrix)
2. Implementation for Priority queue using min heap
   (Insert, delete, search update)
3. Implementation of Dijkstra's algorithm to determine shortest path from all vertices to n^{th} vertex in the list
   (Single Destination Shortest path)
4. Determining shortest path distance and shortest path from all the vertices to destination vertex (Dijkstra's module to be invoked only once)
5. Printing shortest path and shortest path distance from all the vertices to the destination starting with vertex numbered 1,2,3---n-1 as per the output format specified

Marks distribution

Functionality	Max Marks
1+5	5 marks
2, 3, 4	5 marks each