Exercise 9 Dijkstra's Algorithm

9. Write a C++ program for implementation of Dijkstra's algorithm.

Objective

The objectives of this exercise enable you to find the shortest path between two vertices in a graph with the help of Dijkstra's algorithm.

Procedure and description:

This algorithm is used to find the shortest path between the two vertices in a weighted directed graph and it is also very popular and efficient to find each and every path from starting (source) to terminal vertices.

Algorithm:

v_s :Source vertex

v_t. : Terminal vertex (end vertex)

V_r :vertex with label r

$v_{s,z}$: vertex associated with s and z; z intermediate vertices to reach the Terminal vertex

$w(v_i, v_j)$: the weight associated with every edge (v_i, v_j)

Dijkstra's algorithm is given below in stepwise manner:

Step 1: Assign a temporary label 1 $(v_i) = \infty$ to all vertices except v_s

Step 2: Mark v_s. as permanent by assigning 0 label to it

$1(v_{s.z}) = 0$

Step 3: Assign value of v_s to v_r where v_r is last vertex to be made permanent.

$V_r = V_s$

Step 4: If $(v_i) > (v_k) + w(v_k, v_i)$.

$(v_i) = (v_k) + w(v_k, v_i)$.

Step 5: $v_r = v_i$

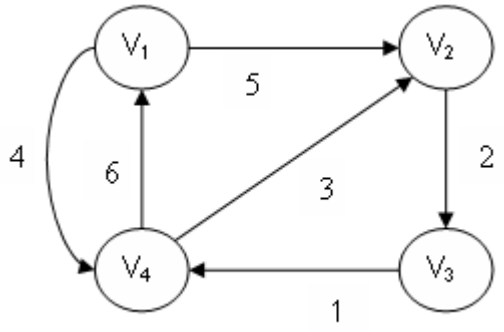
Step 6: If v_t has temporary label, repeat step 4 to step 5 otherwise the value of v_t is permanent label and is equal to the shortest path v_s to v_t.

Step: 7 Exit.

Expected Output:

Input:

After executing program. Enter input graph, vertices and distance between vertices as a two dimensional matrix. For better understanding a graphical representation is shown below



Enter any two vertex's between which the shortest path is to be found. Consider vertices as V1 to V_3 respectively.

Output: the shortest path between V_1 to V_3 is: 7