PRACTICAL 7

//AIM:- WAP and Algorithm of Dijkstra

//Algorithm

1 Initialize-single-source(G-S)

2 S ← O

3 Q ← V[G]

4 While Q ≠ Φ

U ← ExtraMim (Q)

S ← SU{U}

For each vertex v(adj(u))

Do relax (u, v, w)

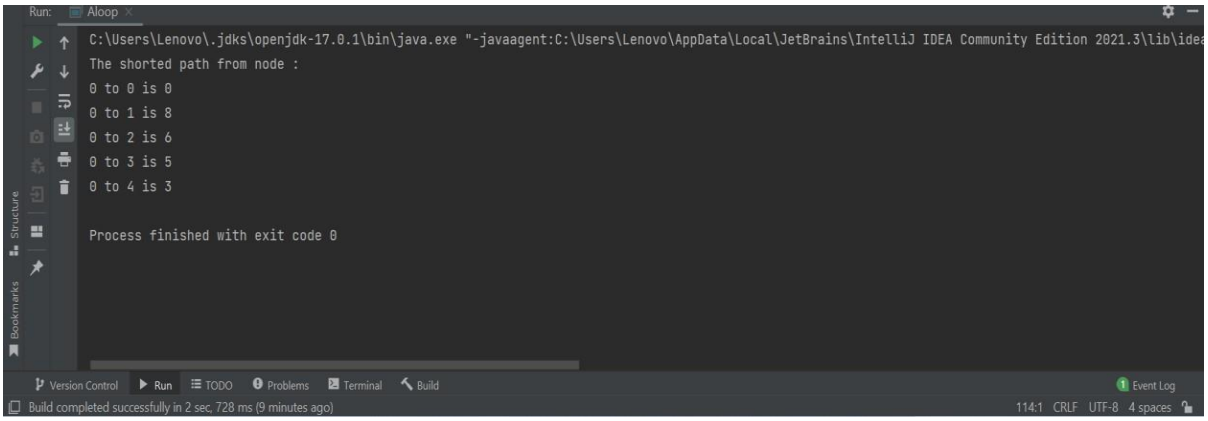
//PROGRAM

```
#include <iostream>
using namespace std;
#include <limits.h>


#define V 9


int minDistance(int dist[], bool sptSet[])
{

   // Initialize min value
   int min = INT_MAX, min_index;

   for (int v = 0; v < V; v++)
      if (sptSet[v] == false && dist[v] <= min)
         min = dist[v], min_index = v;

   return min_index;
}
```

```
void printSolution(int dist[])
{
   cout <<"Vertex \t Distance from Source" << endl;
   for (int i = 0; i < V; i++)
      cout  << i << " \t\t"<<dist[i]<< endl;
}


void dijkstra(int graph[V][V], int src)
{
   int dist[V]; // The output array.  dist[i] will hold the shortest
   // distance from src to i

   bool sptSet[V]; // sptSet[i] will be true if vertex i is included in shortest
   // path tree or shortest distance from src to i is finalized

   // Initialize all distances as INFINITE and stpSet[] as false
   for (int i = 0; i < V; i++)
      dist[i] = INT_MAX, sptSet[i] = false;

   // Distance of source vertex from itself is always 0
   dist[src] = 0;

   // Find shortest path for all vertices
   for (int count = 0; count < V - 1; count++) {

      int u = minDistance(dist, sptSet);

      // Mark the picked vertex as processed
      sptSet[u] = true;

      // Update dist value of the adjacent vertices of the picked vertex.
      for (int v = 0; v < V; v++)

         // Update dist[v] only if is not in sptSet, there is an edge from
         // u to v, and total weight of path from src to  v through u is
         // smaller than current value of dist[v]
         if (!sptSet[v] && graph[u][v] && dist[u] != INT_MAX
            && dist[u] + graph[u][v] < dist[v])
            dist[v] = dist[u] + graph[u][v];
   }

   // print the constructed distance array
```

```
    printSolution(dist);
}

// driver program to test above function
int main()
{

    /* Let us create the example graph discussed above */
    int graph[V][V] = { { 0, 4, 0, 0, 0, 0, 0, 8, 0 },
                        { 4, 0, 8, 0, 0, 0, 0, 11, 0 },
                        { 0, 8, 0, 7, 0, 4, 0, 0, 2 },
                        { 0, 0, 7, 0, 9, 14, 0, 0, 0 },
                        { 0, 0, 0, 9, 0, 10, 0, 0, 0 },
                        { 0, 0, 4, 14, 10, 0, 2, 0, 0 },
                        { 0, 0, 0, 0, 0, 2, 0, 1, 6 },
                        { 8, 11, 0, 0, 0, 0, 1, 0, 7 },
                        { 0, 0, 2, 0, 0, 0, 6, 7, 0 } };

    dijkstra(graph, 0);

    return 0;
}
```

//OUTPUT



//COMPLEXITY

Time Complexity O (V 2)