

## Assignment On

# "Modern Operating System and Computer Networks"

### (Assignment-1.1)

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Question:

Q. Write a C++ program to implement Dijkstra's Single Source Shortest Path Algorithm for a graph represented using an adjacency matrix.

Number of vertices: 5 Edges:

0 1 4

0 2 8

1 4 6

2 3 2

3 4 10

Source vertex: 0

Code :

```
#include <iostream>
#include <climits> // For INT_MAX using
namespace std;

#define V 5 // Number of vertices

// Function to find the vertex with minimum distance value, from //
the set of vertices not yet included in shortest path tree int
minDistance(int dist[], bool sptSet[]) {    int min = INT_MAX,
min_index;
```

```

        for (int v = 0; v < V; v++) {      if
            (!sptSet[v] && dist[v] <= min) {
                min = dist[v];      min_index = v;
            }
        }
        return min_index;
    }

// Function to print the distance array void
printSolution(int dist[]) {   cout << "Vertex \t
Distance from Source\n";
    for (int i = 0; i < V; i++)      cout << i <<
" \t\t " << dist[i] << endl;
}

// Function that implements Dijkstra's single source shortest path algorithm
// for a graph represented using adjacency matrix 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

// Initialize all distances as INFINITE and sptSet[] 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++) {

```

```

// Pick the minimum distance vertex from the set of vertices not yet processed
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 it 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];
    }
}

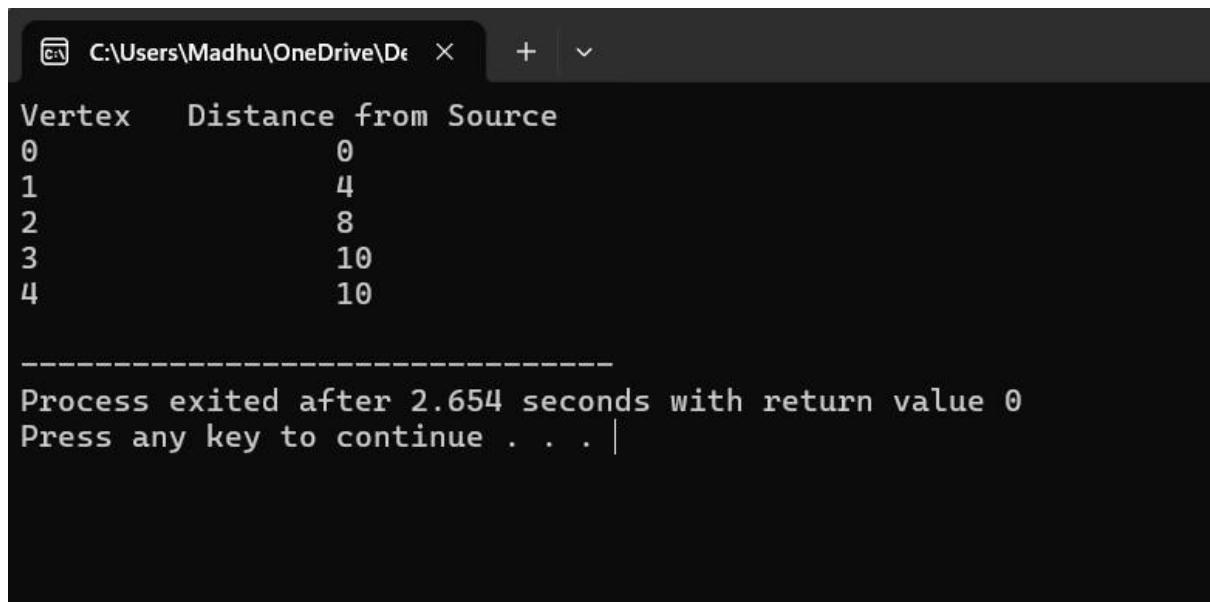
// Print the constructed distance array printSolution(dist);
}

int main() {
    // Adjacency matrix representation of the graph
    int graph[V][V] = {
        {0, 4, 8, 0, 0},
        {0, 0, 0, 0, 6},
        {0, 0, 0, 2, 0},
        {0, 0, 0, 0, 10},
        {0, 0, 0, 0, 0}
    };
}

```

```
int source = 0;  
dijkstra(graph, source);  
  
return 0;  
}
```

Output :



The screenshot shows a terminal window with the following output:

```
C:\Users\Madhu\OneDrive\De + v  
Vertex Distance from Source  
0 0  
1 4  
2 8  
3 10  
4 10  
-----  
Process exited after 2.654 seconds with return value 0  
Press any key to continue . . . |
```