

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);
}

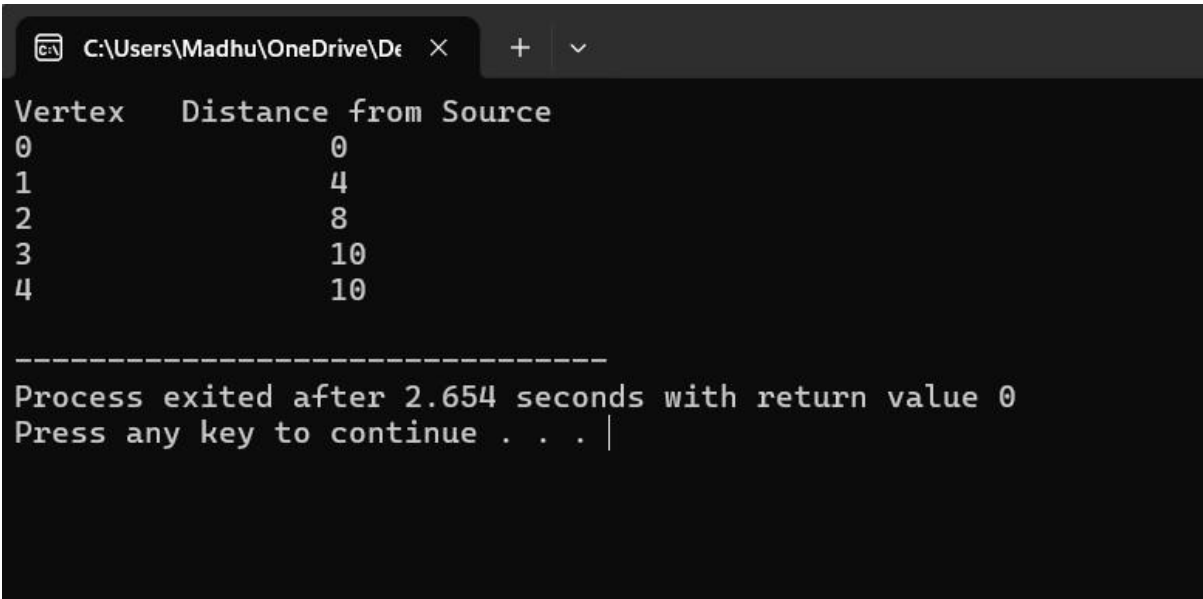
int main() {
    // Adjacency matrix representation of the graph
int graph[V][V] = {
    {0, 4, 8, 0, 0},
    {0, 0, 0, 0, 6},
    {0, 0, 0, 2, 0},
    {0, 0, 0, 0, 10},
    {0, 0, 0, 0, 0}
};

```

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

    return 0;
}
```

Output :



```
C:\Users\Madhu\OneDrive\Desktop >
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 . . . |
```