2024-28-CSE-B

## Aim:

Implement the Floyd-Warshall algorithm in C for finding the shortest distances between all pairs of vertices in a weighted directed graph. Prompt the user to input the number of vertices (N) and edges (E), and then accept edge information (source, destination, and weight) to build the adjacency matrix.

## **Source Code:**

## Warshall.c

```
// #include <stdio.h>
// #define INF 99999
// \#define MAX_N 20 // Maximum value for N
#include<stdio.h>
#define MAX_N 20
#define INF 9999
int main(){
   int dist[MAX_N][MAX_N];
   int n,e;
   int i,j,k;
   printf("Enter the number of vertices : ");
   scanf("%d",&n);
   printf("Enter the number of edges : ");
   scanf("%d",&e);
   for (i=0;i<n;i++){
      for (j=0;j<n;j++){
         if (i==j)
            dist[i][j]=0;
         else
            dist[i][j]=INF;
      }
   }
   for (i=0;i<e;i++){
      int u,v,w;
      printf("Enter source : ");
      scanf("%d",&u);
      printf("Enter destination : ");
      scanf("%d",&v);
      printf("Enter weight : ");
      scanf("%d",&w);
      dist[u-1][v-1]=w;
   }
   for (k=0;k< n;k++){
      for (i=0;i<n;i++){
         for (j=0; j< n; j++){
            if (dist[i][k] != INF \&\& dist[k][j] != INF \&\& dist[i][j]>dist[i][k]+dist
[k][j]){
               dist[i][j]=dist[i][k]+dist[k][j];
```

```
}
         }
      }
   }
   printf("The following matrix shows the shortest distances between all pairs of the
vertices.\n");
   for (i=0;i<n;i++){
      for (j=0;j< n;j++){}
         if (dist[i][j]==INF)
            printf("%5s","INF");
         else
            printf("%5d",dist[i][j]);
      printf("\n");
   return 0;
}
```

## Execution Results - All test cases have succeeded!

```
Test Case - 1
User Output
Enter the number of vertices :
Enter the number of edges : 5
Enter source : 1
Enter destination : 2
Enter weight: 4
Enter source : 1
Enter destination : 4
Enter weight: 10
Enter source : 1
Enter destination: 3
Enter weight: 6
Enter source :
Enter destination : 4
Enter weight: 5
Enter source : 3
Enter destination: 4
Enter weight: 2
The following matrix shows the shortest distances between all pairs of the vertices.
 INF
        0
           INF
                  5
 INF
      INF
             0
                   2
 INF
      INF
           INF
                  0
```

```
Test Case - 2
User Output
Enter the number of vertices : 5
Enter the number of edges : 6
Enter source : 1
```

Enter weight : 2  Enter source : 1  Enter destination : 5	
Enter destination · 5	
Enter describation . 5	
Enter weight: 3	
Enter source : 2	
Enter destination : 4	
Enter weight: 4	
Enter source : 2	
Enter destination : 3	
Enter weight: 7	
Enter source : 4	
Enter destination : 3	
Enter weight: 2	
Enter source : 5	
Enter destination : 4	
Enter weight : 1	
The following matrix shows the shortest distances between all pairs of the vertices.	
0 2 6 4 3	
INF 0 6 4 INF	
INF INF 0 INF INF	
INF INF 2 0 INF	
INF INF 3 1 0	

Enter the number of vertices: 4 Enter the number of edges: 5 Enter source: 1 Enter destination: 2 Enter weight: 4 Enter source: 3 Enter destination: 2 Enter weight: 5 Enter source: 4 Enter source: 4 Enter destination: 1 Enter destination: 1 Enter weight: 1 Enter weight: 1 Enter source: 4 Enter source: 4 Enter source: 4 Enter destination: 2 Enter weight: 3 Enter weight: 3 Enter weight: 3 Enter source: 4 Enter destination: 3 Enter weight: 8	Test Case - 3
Enter the number of edges : 5 Enter source : 1 Enter destination : 2 Enter weight : 4 Enter source : 3 Enter destination : 2 Enter weight : 5 Enter source : 4 Enter source : 4 Enter destination : 1 Enter weight : 1 Enter weight : 1 Enter source : 4 Enter source : 4 Enter destination : 2 Enter weight : 3 Enter destination : 2 Enter weight : 3 Enter source : 4 Enter destination : 3 Enter weight : 8 Enter following matrix shows the shortest distances between all pairs of the vertices.  0  4 INF INF INF 0 INF INF	User Output
Enter source : 1 Enter destination : 2 Enter weight : 4 Enter source : 3 Enter destination : 2 Enter weight : 5 Enter source : 4 Enter source : 4 Enter destination : 1 Enter weight : 1 Enter source : 4 Enter source : 4 Enter source : 4 Enter destination : 2 Enter weight : 3 Enter destination : 3 Enter weight : 3 Enter weight : 3 Enter source : 4 Enter floring matrix shows the shortest distances between all pairs of the vertices.  0  4 INF INF INF 0 INF INF	Enter the number of vertices : 4
Enter destination : 2 Enter weight : 4 Enter source : 3 Enter destination : 2 Enter weight : 5 Enter source : 4 Enter destination : 1 Enter destination : 1 Enter weight : 1 Enter weight : 3 Enter source : 4 Enter destination : 2 Enter weight : 3 Enter weight : 3 Enter source : 4 Enter source : 4 Enter source : 4 Enter festination : 3 Enter weight : 8 Enter weight : 9 Enter weig	Enter the number of edges : 5
Enter weight: 4 Enter source: 3 Enter destination: 2 Enter weight: 5 Enter source: 4 Enter destination: 1 Enter weight: 1 Enter source: 4 Enter source: 4 Enter source: 4 Enter destination: 2 Enter weight: 3 Enter weight: 3 Enter source: 4 Enter destination: 3 Enter source: 4 Enter destination: 3 Enter weight: 8 Enter following matrix shows the shortest distances between all pairs of the vertices.  0  4 INF INF INF 0 INF INF	Enter source : 1
Enter source : 3 Enter destination : 2 Enter weight : 5 Enter source : 4 Enter destination : 1 Enter weight : 1 Enter source : 4 Enter source : 4 Enter destination : 2 Enter weight : 3 Enter source : 4 Enter destination : 3 Enter weight : 8 Enter destination : 3 Enter weight : 8 Enter source : 4 Enter destination : 3 Enter weight : 8 Enter source : 4 Enter destination : 3 Enter weight : 8 Enter source : 4 Enter destination : 3 Enter weight : 8 Enter source : 4 Enter destination : 3 Enter source : 4 Enter destination : 3 Enter source : 4 Enter destination : 3 Enter source : 4 En	Enter destination : 2
Enter destination : 2 Enter weight : 5 Enter source : 4 Enter destination : 1 Enter weight : 1 Enter source : 4 Enter destination : 2 Enter destination : 2 Enter destination : 3 Enter source : 4 Enter source : 4 Enter destination : 3 Enter weight : 8 Enter weig	Enter weight : 4
Enter weight: 5 Enter source: 4 Enter destination: 1 Enter weight: 1 Enter source: 4 Enter destination: 2 Enter weight: 3 Enter weight: 3 Enter source: 4 Enter source: 4 Enter destination: 3 Enter weight: 8 The following matrix shows the shortest distances between all pairs of the vertices.  0  4 INF INF INF 0 INF INF	Enter source : 3
Enter source : 4 Enter destination : 1 Enter weight : 1 Enter source : 4 Enter destination : 2 Enter weight : 3 Enter weight : 3 Enter source : 4 Enter source : 4 Enter destination : 3 Enter destination : 3 Enter weight : 8 The following matrix shows the shortest distances between all pairs of the vertices.  0  4 INF INF INF 0 INF INF	Enter destination : 2
Enter destination: 1 Enter weight: 1 Enter source: 4 Enter destination: 2 Enter weight: 3 Enter source: 4 Enter source: 4 Enter source: 4 Enter festination: 3 Enter weight: 8 The following matrix shows the shortest distances between all pairs of the vertices.  Ø 4 INF INF INF Ø INF INF	Enter weight : 5
Enter weight: 1 Enter source: 4 Enter destination: 2 Enter weight: 3 Enter source: 4 Enter destination: 3 Enter destination: 3 Enter destination: 3 Enter weight: 8 The following matrix shows the shortest distances between all pairs of the vertices.  0  4  INF  INF INF  0  INF  INF	Enter source : 4
Enter source : 4 Enter destination : 2 Enter weight : 3 Enter source : 4 Enter destination : 3 Enter destination : 3 Enter weight : 8 The following matrix shows the shortest distances between all pairs of the vertices.  0  4 INF INF INF 0 INF INF	Enter destination : 1
Enter destination : 2 Enter weight : 3 Enter source : 4 Enter destination : 3 Enter weight : 8 The following matrix shows the shortest distances between all pairs of the vertices.  0  4 INF INF INF 0 INF INF	Enter weight : 1
Enter weight : 3 Enter source : 4 Enter destination : 3 Enter weight : 8 The following matrix shows the shortest distances between all pairs of the vertices.  0  4 INF INF INF 0 INF INF	Enter source : 4
Enter source : 4 Enter destination : 3 Enter weight : 8 The following matrix shows the shortest distances between all pairs of the vertices.  0  4 INF INF INF 0 INF INF	Enter destination : 2
Enter destination : 3 Enter weight : 8 The following matrix shows the shortest distances between all pairs of the vertices.  0 4 INF INF INF 0 INF INF	Enter weight: 3
Enter weight: 8 The following matrix shows the shortest distances between all pairs of the vertices.  0 4 INF INF INF 0 INF INF	Enter source : 4
The following matrix shows the shortest distances between all pairs of the vertices.  0 4 INF INF INF 0 INF INF	Enter destination : 3
0 4 INF INF INF 0 INF INF	Enter weight: 8
INF 0 INF INF	The following matrix shows the shortest distances between all pairs of the vertices.
	0 4 INF INF
INF 5 0 INF	INF 0 INF INF
	INF 5 0 INF
1 3 8 0	1 3 8 0

User Output
Enter the number of vertices : 4
Enter the number of edges : 6
Enter source : 1
Enter destination : 2
Enter weight : 1
Enter source : 1
Enter destination : 4
Enter weight : 3
Enter source : 2
Enter destination : 3
Enter weight : 6
Enter source : 3
Enter destination : 1
Enter weight : -2
Enter source : 4
Enter destination : 2
Enter weight : 5
Enter source : 4
Enter destination : 3
Enter weight : 10
The following matrix shows the shortest distances between all pairs of the vertices.
0 1 7 3
4 0 6 7
-2 -1 0 1
8 5 10 0