# ADA LAB WEEK 7

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## 1) Find Minimum Cost Spanning Tree of a given undirected graph using Prim's and Kruskal's algorithm.

```
#include <stdio.h>
int parent[10];
int a[10][10];
int n;
int t[10][2];
void kruskals(int cost[10][10]){
    int count=0;
    int k=0;
    int u,v;
    int i,j,sum=0;
    while(count!=n-1){
        int min=999;
        for(int i=0;i<n;i++){
            parent[i]=i;
        }
        for(int i=0;i<n;i++){
            for(int j=0;j<n;j++){
                if(cost[i][j]<min && cost[i][j]!=0){
                    min=cost[i][j];
                    u=i;
                    v=j;
                }
```

```
            }
        }
        i=find(u);
        j=find(v);
        if(i!=j){
            t[k][0]=u;
            t[k][1]=v;
            k++;
            count++;
            sum+=cost[i][j];
            unionn(i,j);
        }
        cost[u][v]=cost[v][u]=999;
    }
    printf("the minimal spannning tree is:\n");
    for(int i=0;i<k;i++){
        printf("%d->%d\n",t[i][0],t[i][1]);
    }
    printf("optimal solution: %d",sum);
}
int find(int a){
    while(parent[a]!=a){
        a=parent[a];
    }
    return a;
}
void unionn(int a,int b){
    if(a<b){
        parent[b]=a;
    }
    else{
        parent[a]=b;
    }
}
int main(){
    printf("enter the number of vertices:\n");
```

```
    scanf("%d",&n);
    printf("enter the cost matrix:\n");
    for(int i=0;i<n;i++){
        for(int j=0;j<n;j++){
            scanf("%d",&a[i][j]);
        }
    }
    kruskals(a);
    return 0;
}
```

**Output:**

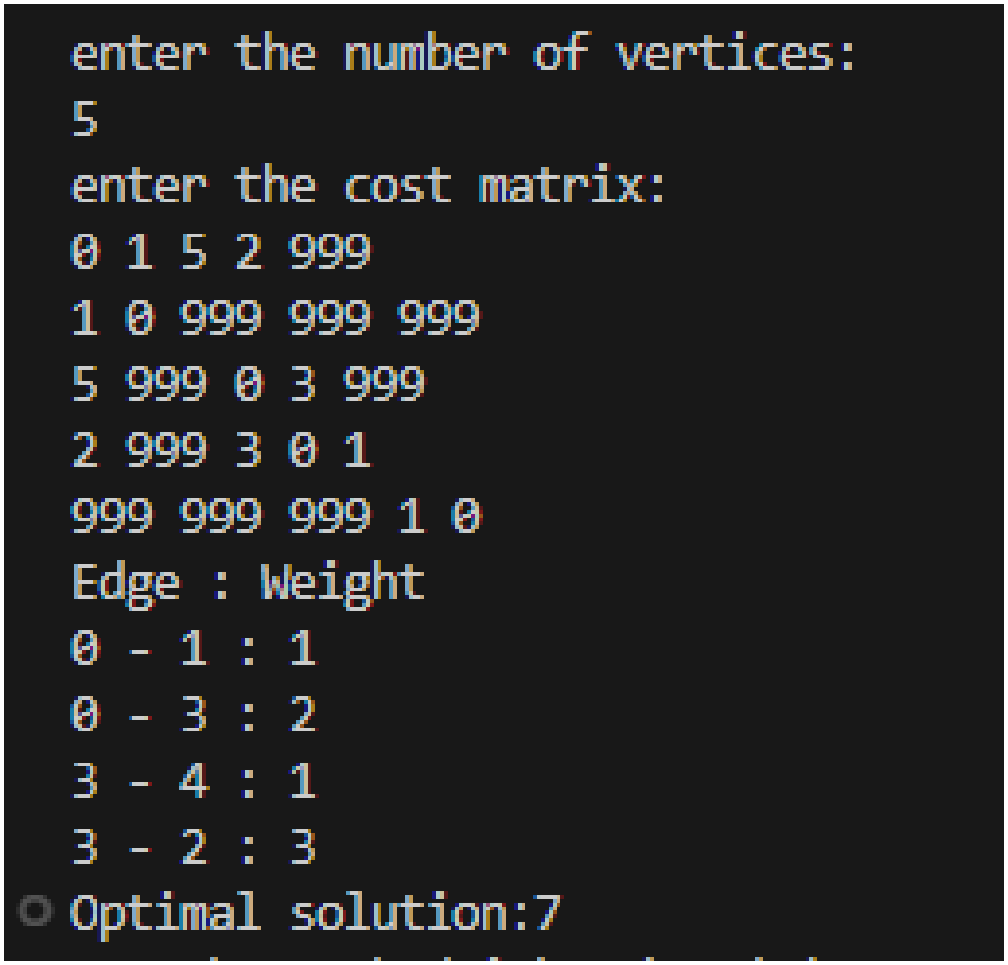
```
enter the number of vertices:
5
enter the cost matrix:
0 1 5 2 999
1 0 999 999 999
5 999 0 3 999
2 999 3 0 2
999 999 999 2 0
the minimal spannning tree is:
0->1
0->3
3->4
2->3
optimal solution: 8
```

**Prims Algorithm:**

```
#include <stdio.h>
#include <stdbool.h>
#define INF 999
#define V 5
int n;
int G[V][V];

int main()
{
   int sum=0;
   printf("enter the number of vertices:\n");
   scanf("%d", &n);
   printf("enter the cost matrix:\n");
   for (int i = 0; i < n; i++)
   {
      for (int j = 0; j < n; j++)
      {
         scanf("%d", &G[i][j]);
      }
   }
   int no_edge;
   int selected[V];
   memset(selected, false, sizeof(selected));
   no_edge = 0;
   selected[0] = true;

   int x;
   int y;
   printf("Edge : Weight\n");

   while (no_edge < V - 1)
```

```
    {

        int min = INF;
        x = 0;
        y = 0;

        for (int i = 0; i < V; i++)
        {
            if (selected[i])
            {
                for (int j = 0; j < V; j++)
                {
                    if (!selected[j] && G[i][j])
                    {
                        if (min > G[i][j])
                        {
                            min = G[i][j];
                            x = i;
                            y = j;
                        }
                    }
                }
            }
        }
        printf("%d - %d : %d\n", x, y, G[x][y]);
        sum+=G[x][y];
        selected[y] = true;
        no_edge++;
    }
    printf("Optimal solution:%d",sum);
    return 0;
}
```

**OUTPUT:**

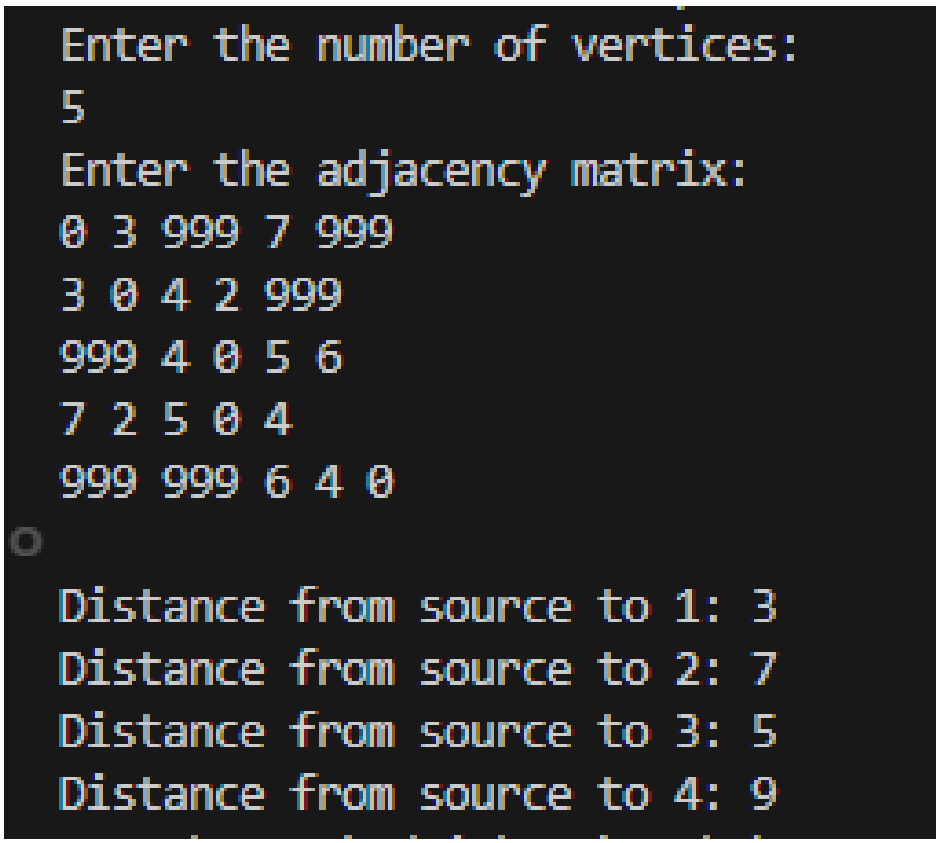

enter the number of vertices:
5
enter the cost matrix:
0 1 5 2 999
1 0 999 999 999
5 999 0 3 999
2 999 3 0 1
999 999 999 1 0
Edge : Weight
0 - 1 : 1
0 - 3 : 2
3 - 4 : 1
3 - 2 : 3
Optimal solution:7

**2) From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.**

```
#include <stdio.h>
#define INFINITY 999
#define MAX 10

void Dijkstra(int Graph[MAX][MAX], int n, int start);

void Dijkstra(int Graph[MAX][MAX], int n, int start) {
  int cost[MAX][MAX], distance[MAX], pred[MAX];
  int visited[MAX], count, mindistance, nextnode, i, j;
  for (i = 0; i < n; i++)
    for (j = 0; j < n; j++)
      if (Graph[i][j] == 0)
        cost[i][j] = INFINITY;
      else
        cost[i][j] = Graph[i][j];

  for (i = 0; i < n; i++) {
    distance[i] = cost[start][i];
    pred[i] = start;
    visited[i] = 0;
  }

  distance[start] = 0;
  visited[start] = 1;
  count = 1;

  while (count < n - 1) {
    mindistance = INFINITY;

    for (i = 0; i < n; i++)
      if (distance[i] < mindistance && !visited[i]) {
```

```
      mindistance = distance[i];
      nextnode = i;
     }

   visited[nextnode] = 1;
   for (i = 0; i < n; i++)
    if (!visited[i])
     if (mindistance + cost[nextnode][i] < distance[i]) {
      distance[i] = mindistance + cost[nextnode][i];
      pred[i] = nextnode;
     }
   count++;
  }
  for (i = 0; i < n; i++)
   if (i != start) {
    printf("\nDistance from source to %d: %d", i, distance[i]);
   }
}
int main() {
  int Graph[MAX][MAX], i, j, n, u;
  printf("Enter the number of vertices:\n");
  scanf("%d",&n);
  printf("Enter the adjacency matrix:\n");
  for(i=0;i<n;i++)
  {
     for(j=0;j<n;j++)
     {
        scanf("%d",&Graph[i][j]);
     }
  }
  u = 0;
  Dijkstra(Graph, n, u);
  return 0;
}
```

**Output:**


Enter the number of vertices:
5
Enter the adjacency matrix:
0 3 999 7 999
3 0 4 2 999
999 4 0 5 6
7 2 5 0 4
999 999 6 4 0
Distance from source to 1: 3
Distance from source to 2: 7
Distance from source to 3: 5
Distance from source to 4: 9