11. Design, Develop and Implement a Program in C for the following operations on Graph(G) of Cities

a. Create a Graph of N cities using Adjacency Matrix.

b. Print all the nodes reachable from a given starting node in a digraph using DFS/BFS method

```
#include<stdio.h>
#include<stdlib.h>
int n,a[10][10],i,j,source,s[10],reach[10],choice,count=0;
void bfs(int n,int a[10][10],int source,int s[])       //BFS Algorithm
{
        int q[10],u;
        int front=1,rear=1;
        s[source]=1;
        q[rear]=source;
        while(front<=rear)
        {
                u=q[front];
                front=front+1;
                for(i=1;i<=n;i++)
                if(a[u][i]==1 &&s[i]==0)
                {       rear=rear+1;
                        q[rear]=i;
                        s[i]=1;
                }
        }
}
void dfs(int v)    //DFS Algorithm
{
int i;
reach[v]=1;
for(i=1;i<=n;i++)
{
if(a[v][i] && !reach[i])
{
printf("\n %d->%d",v,i);
count++;
dfs(i);
}
}
}
```

```
int main()
{
    printf("Enter the number of nodes : ");
    scanf("%d",&n);
    printf("\n Enter the adjacency matrix\n");
    for(i=1;i<=n;i++)//Provide matrix of 0’s and 1’s
        for(j=1;j<=n;j++)
            scanf("%d",&a[i][j]);
    while(1)
    {
printf("\nEnter your choice\n");
printf("1.BFS\n 2.DFS\n 3.Exit\n");
scanf("%d",&choice);
switch(choice)
{
case 1:  printf("\n Enter the source :");
                scanf("%d",&source);     //Provide source for BFS
                for(i=1;i<=n;i++)
                    s[i]=0;
                bfs(n,a,source,s);
                for(i=1;i<=n;i++)
                {
                    if(s[i]==0)
                        printf("\n The node %d is not reachable",i);
                    else
                        printf("\n The node %d is reachable",i);
                 }
break;
case 2: dfs(1);
if(count==n-1)
                    printf("\nThe graph is connected.");
                else
                    printf("\nThe graph is not connected.");
   break;
case 3: exit(0);
}
}
}
```

Output 1:-

```
Enter the number of nodes : 3

 Enter the adjacency matrix
1 0 0
0 1 0
0 0 1

Enter your choice
1.BFS
 2.DFS
 3.Exit
1

 Enter the source :1

 The node 1 is reachable
 The node 2 is not reachable
 The node 3 is not reachable
Enter your choice
1.BFS
 2.DFS
 3.Exit
1

 Enter the source :2

 The node 1 is not reachable
 The node 2 is reachable
 The node 3 is not reachable
Enter your choice
1.BFS
 2.DFS
 3.Exit
1

 Enter the source :3

 The node 1 is not reachable
 The node 2 is not reachable
 The node 3 is reachable
Enter your choice
```

```
1.BFS
 2.DFS
 3.Exit
2

The graph is not connected.
Enter your choice
1.BFS
 2.DFS
 3.Exit
```

Output:-2

```
Enter the number of nodes : 3

 Enter the adjacency matrix
1 1 1
1 1 1
1 1 1

Enter your choice
1.BFS
 2.DFS
 3.Exit
2

 1->2
 2->3
The graph is connected.
Enter your choice
1.BFS
 2.DFS
 3.Exit
```