VISVESVARAYA TECHNOLOGICAL UNIVERSITY

“JnanaSangama”, Belgaum -590014, Karnataka.

LAB REPORT
on

Analysis and Design of Algorithms

Submitted by

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in partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

in

COMPUTER SCIENCE AND ENGINEERING

B.M.S. COLLEGE OF ENGINEERING
(Autonomous Institution under VTU)
BENGALURU-560019
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B. M. S. College of Engineering,

Bull Temple Road, Bangalore 560019

(Affiliated To Visvesvaraya Technological University, Belgaum)

Department of Computer Science and Engineering

CERTIFICATE

This is to certify that the Lab work entitled "**Analysis and Design of Algorithms**" carried out by **DHRAVYA M(1BM21CS056),** who is a bonafide student of **B.M.S. College of Engineering.** It is in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum during the academic semester June-2023 to September-2023. The Lab report has been approved as it satisfies the academic requirements in respect of a **Analysis and Design of Algorithms (22CS4PCADA)** work prescribed for the said degree.

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Index Sheet

Course Outcome

CO1	Analyze time complexity of Recursive and Non-recursive algorithms using asymptotic notations.
CO2	Apply various design techniques for the given problem.
CO3	Apply the knowledge of complexity classes P, NP, and NP-Complete and prove certain problems are NP-Complete
CO4	Design efficient algorithms and conduct practical experiments to solve problems.

WEEK 1

Write program to do the following:
a. Print all the nodes reachable from a given starting node in a digraph using BFS method.
b. Check whether a given graph is connected or not using the DFS method.

a)BFS

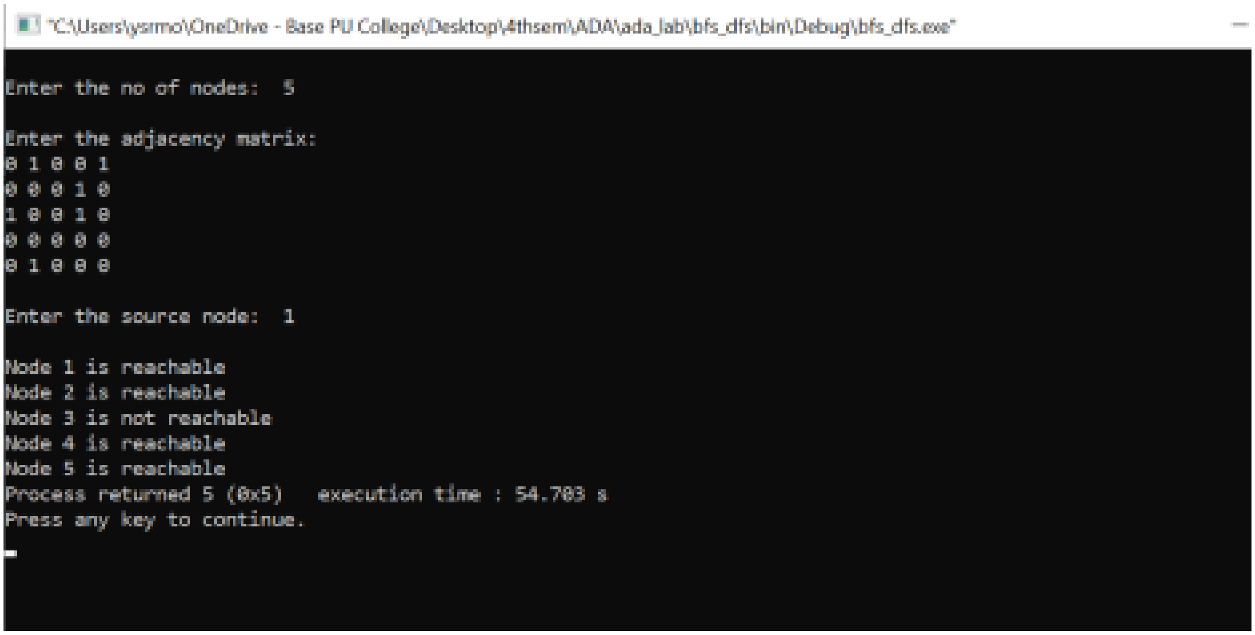
Code:

```
#include<stdio.h>
#include<conio.h>

int a[15][15],n;
void bfs(int);

void main() {
 int i,j,src;

 printf("\nEnter the no of nodes:\t");

 scanf("%d",&n);

 printf("\nEnter the adjacency matrix:\n");

 for(i=1;i<=n;i++)

    for(j=1;j<=n;j++)

     scanf("%d",&a[i][j]);

 printf("\nEnter the source node:\t");

 scanf("%d",&src);

 bfs(src);
```

```
}
voidbfs(intsrc){
 intq[15],f=0,r=-1,vis[15],i,j;
 for(j=1;j<=n;j++)
    vis[j]=0;
 vis[src]=1;
 r=r+1;
 q[r]=src;
 while(f<=r){
  i=q[f];
  f=f+1;
  for(j=1;j<=n;j++)
   {
   if(a[i][j]==1&&vis[j]!=1){
    vis[j]=1;
    r=r+1;
    q[r]=j;
   }
  }
 }
```

```
for(j=1;j<=n;j++) {

if(vis[j]!=1)

printf("\nNode %d is not reachable",j);

else

printf("\nNode %d is reachable",j);

}

}
```

Output:


"C:\Users\ysrmo\OneDrive - Base PU College\Desktop\4thsem\ADA\ada_lab\bfs_dfs\bin\Debug\bfs_dfs.exe"

```
Enter the no of nodes:  5

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

Enter the source node:  1

Node 1 is reachable
Node 2 is reachable
Node 3 is not reachable
Node 4 is reachable
Node 5 is reachable
Process returned 5 (0x5)   execution time : 54.703 s
Press any key to continue.
```

b)DFS

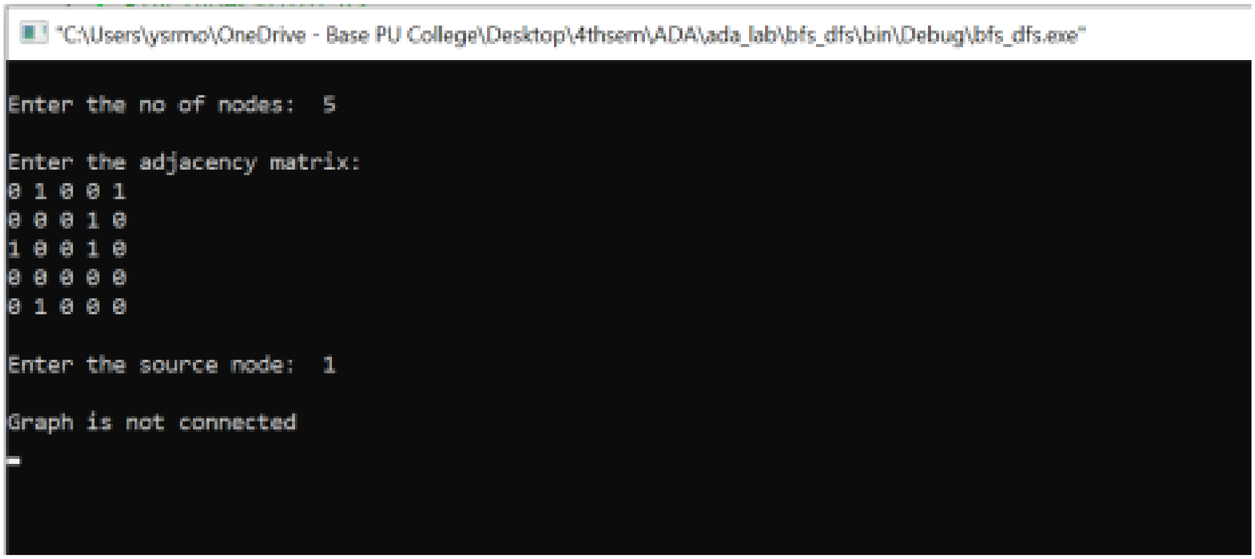
Code:

```
#include<stdio.h>
#include<conio.h>

inta[10][10],n,vis[10];
intdfs(intsrc){
    intj;
     vis[src]=1;
     for(j=1;j<=n;j++)
      if(a[src][j]==1&&vis[j]!=1)
       dfs(j);
     for(j=1;j<=n;j++){
      if(vis[j]!=1)
       return0;
     }
     return1;
}
voidmain()
 {
 inti,j,src,ans;
 for(j=1;j<=n;j++)
  vis[j]=0;
 printf("\nEnterthenoofnodes:\t");
 scanf("%d",&n);
 printf("\nEntertheadjacencymatrix:\n");
 for(i=1;i<=n;i++)
  for(j=1;j<=n;j++)
   scanf("%d",&a[i][j]);
 printf("\nEnterthesourcenode:\t");
 scanf("%d",&src);
 ans=dfs(src);
```

```
if(ans==1)
printf("\nGraph is connected\n");
```

```
else
printf("\nGraph is not connected\n");
getch();
}
```

Output:


"C:\Users\ysrmo\OneDrive - Base PU College\Desktop\4thsem\ADA\ada_lab\bfs_dfs\bin\Debug\bfs_dfs.exe"

```
Enter the no of nodes:  5

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

Enter the source node:  1

Graph is not connected
```

WEEK 2

Write program to obtain the Topological ordering of vertices in a given digraph.

Code:

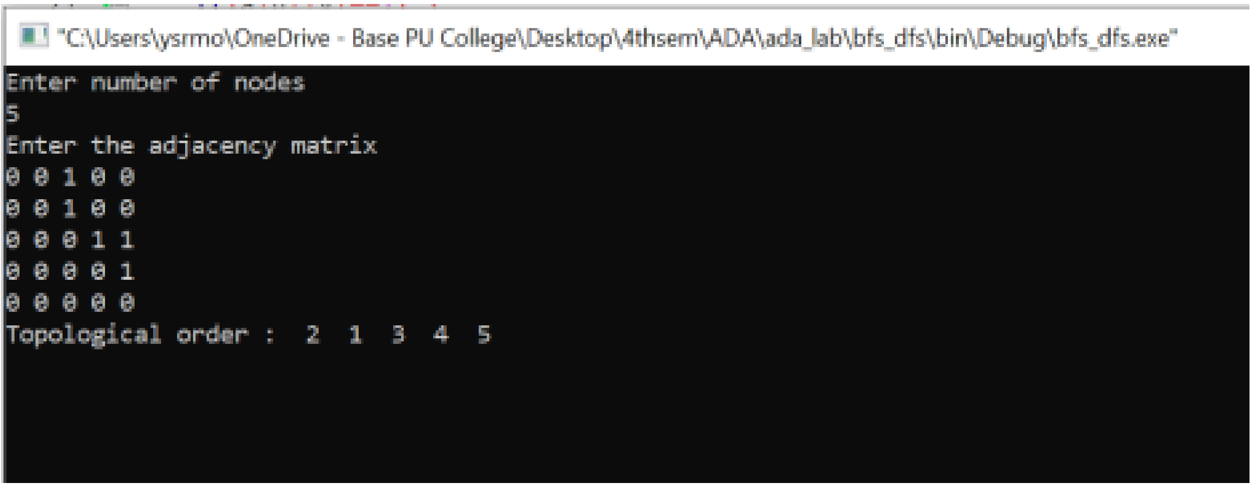
```
#include<stdio.h>

#include<conio.h>

 void dfs(int n, int a[10][10]) {

          int i,j,k,u,v,top,s[10],t[10],indeg[10],sum;

          for(i=0;i<n;i++) {

          sum=0;
```

```
for(j=0;j<n;j++)
sum+=a[j][i];
indeg[i]=sum;
}
top=-1;
for(i=0;i<n;i++) {
if(indeg[i]==0)
s[++top]=i;
}
k=0;
while(top!=-1) {
u=s[top--];
```

```
t[k++]=u;
for(v=0;v<n;v++) {
if(a[u][v]==1) {
        indeg[v]=indeg[v]-1;
        if(indeg[v]==0)
        s[++top]=v;
}
}
}
printf("Topological order :");
```

```
          for(i=0;i<n;i++)
          printf(" %d", t[i]);
}

void main() {
int i,j,a[10][10],n;
printf("Enter number of nodes\n");
scanf("%d", &n);
printf("Enter the adjacency matrix\n");
for(i=0;i<n;i++)
          for(j=0;j<n;j++)
          scanf("%d", &a[i][j]);
dfs(n,a);

getch();
}
```

Output:



"C:\Users\ysrmo\OneDrive - Base PU College\Desktop\4thsem\ADA\ada_lab\bfs_dfs\bin\Debug\bfs_dfs.exe"

```
Enter number of nodes
5
Enter the adjacency matrix
0 0 1 0 0
0 0 1 0 0
0 0 0 1 1
0 0 0 0 1
0 0 0 0 0
Topological order :  2  1  3  4  5
```

WEEK 3

Implement Johnson Trotter algorithm to generate permutations.

CODE:

```
#include <stdio.h>
#include <stdlib.h>
int flag = 0;

int swap(int *a,int *b) {
 int t = *a;
 *a = *b;
 *b = t;
}
int search(int arr[],int num,int mobile)
 {
 int g;
 for(g=0;g<num;g++) {
 if(arr[g] == mobile)
   return g+1;
 else
```

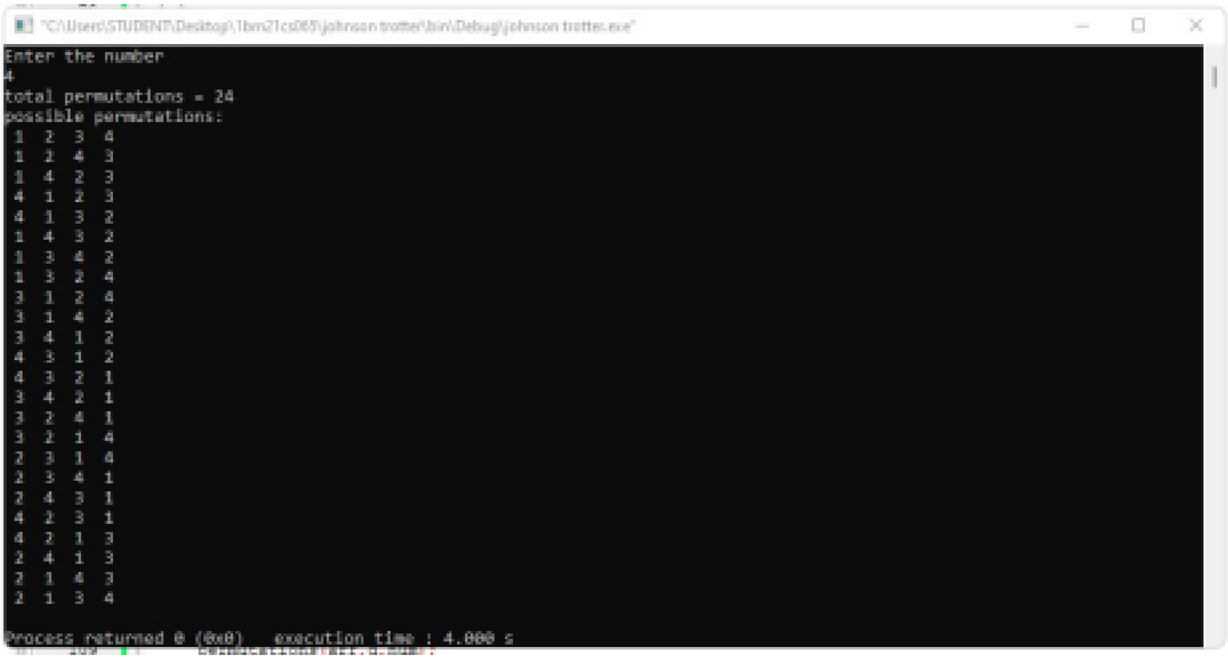
```
    flag++;
  }
 return -1;
 }

int find_Moblie(int arr[],int d[],int num)
 {
 int mobile = 0;
 int mobile_p = 0;
 int i;
 for(i=0;i<num;i++)
  {
 if((d[arr[i]-1] == 0) && i != 0)
```

```
  {
 if(arr[i]>arr[i-1]&&arr[i]>mobile_p)
  {
 mobile=arr[i];
 mobile_p=mobile;
  }
 else
    flag++;
  }
 elseif((d[arr[i]-1]==1)&i !=num-1)
 {
 if(arr[i]>arr[i+1]&&arr[i]>mobile_p)
 {
 mobile=arr[i];
 mobile_p=mobile;
  }
 else
    flag++;
  }
 else
    flag++;
 }
 if((mobile_p==0)&&(mobile==0))
 return0;
 else
 returnmobile;
}
voidpermutations(intarr[],intd[],intnum)
{
 inti;
 intmobile=find_Moblie(arr,d,num);
 intpos=search(arr,num,mobile);
 if(d[arr[pos-1]-1]==0)
 swap(&arr[pos-1],&arr[pos-2]);
```

```
 else
 swap(&arr[pos-1],&arr[pos]);
 for(inti=0;i<num;i++)
  {
 if(arr[i]>mobile)
  {
 if(d[arr[i]-1]==0)
 d[arr[i]-1]=1;
 else
 d[arr[i]-1]=0;
  }
  }
 for(i=0;i<num;i++)
  {
 printf("%d",arr[i]);
  }}

intfactorial(intk)
{
 intf=1;
 inti=0;
 for(i=1;i<k+1;i++)
    f=f*i;
 returnf;
}
intmain()
 {
 intnum=0;
 inti;
 intj;
 intz=0;
 printf("Enterthenumber\n");
 scanf("%d",&num);
 intarr[num],d[num];
```

```
z = factorial(num);
printf("total permutations = %d",z);
printf("\npossible permutations: \n");
for(i=0;i<num;i++)
{
d[i] = 0;
arr[i] = i+1;
printf(" %d ",arr[i]);
}
printf("\n");
for(j=1;j<z;j++) {
permutations(arr,d,num);
printf("\n");
}
return 0;
}
```

OUTPUT:



"C:\Users\STUDENT\Desktop\1bm21cs085\johnson trotter\bin\Debug\johnson trotter.exe"

```
Enter the number
4
total permutations = 24
possible permutations:
 1  2  3  4
 1  2  4  3
 1  4  2  3
 4  1  2  3
 4  1  3  2
 1  4  3  2
 1  3  4  2
 1  3  2  4
 3  1  2  4
 3  1  4  2
 3  4  1  2
 4  3  1  2
 4  3  2  1
 3  4  2  1
 3  2  4  1
 3  2  1  4
 2  3  1  4
 2  3  4  1
 2  4  3  1
 4  2  3  1
 4  2  1  3
 2  4  1  3
 2  1  4  3
 2  1  3  4

Process returned 0 (0x0)   execution time : 4.000 s
```

WEEK 4

Sort a given set of N integer elements using Merge Sort technique.

CODE:

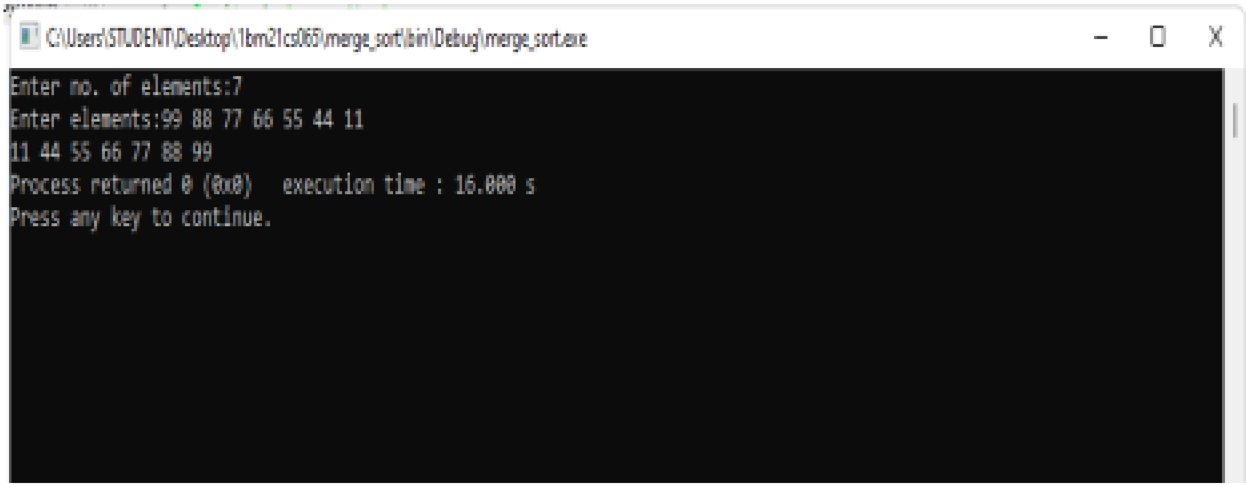
```
#include <stdio.h>
#include <stdlib.h>


void merge(int low,int mid,int high,int array[20],int mer[20])
 {
    int i = low;
    int j = mid+1;
    int k = 0;

    while(i<=mid && j<=high)
     {
        if(array[i]<array[j])
         {
           mer[k] = array[i];
           i++;
           k++;
        }
        else
        {
           mer[k] = array[j];
          j++;
           k++;
        }
    }

   while (i <= mid)
    {
       mer[k] = array[i];
```

```
       i++;
       k++;
    }

   while (j <= high)
    {
       mer[k] = array[j];
      j++;
       k++;
    }

   for(int i=0;i<k;i++)
    {
       array[low+i] = mer[i];
    }
}

void merge_sort(int low,int high,int array[20],int merged[20])
 {
   if(low<high)
```

```
    {
       int mid = (low+high)/2;
       merge_sort(low,mid,array,merged);
       merge_sort(mid+1,high,array,merged);
       merge(low,mid,high,array,merged);
    }
}


int main()
 {
   int n,array[30];
   printf("Enter no. of elements:");
   scanf("%d",&n);
```

```
printf("Enter elements:");
for(int i=0;i<n;i++)
{
scanf("%d",&array[i]);
}

int merged[30];

merge_sort(0,n-1,array,merged);

for(int i=0;i<n;i++)
{
printf("%d ",array[i]);
}
}
```

OUTPUT:



C:\Users\STUDENT\Desktop\1bm21cs065\merge_sort\bin\Debug\merge_sort.exe

```
Enter no. of elements:7
Enter elements:99 88 77 66 55 44 11
11 44 55 66 77 88 99
Process returned 0 (0x0)   execution time : 16.000 s
Press any key to continue.
```

WEEK 5

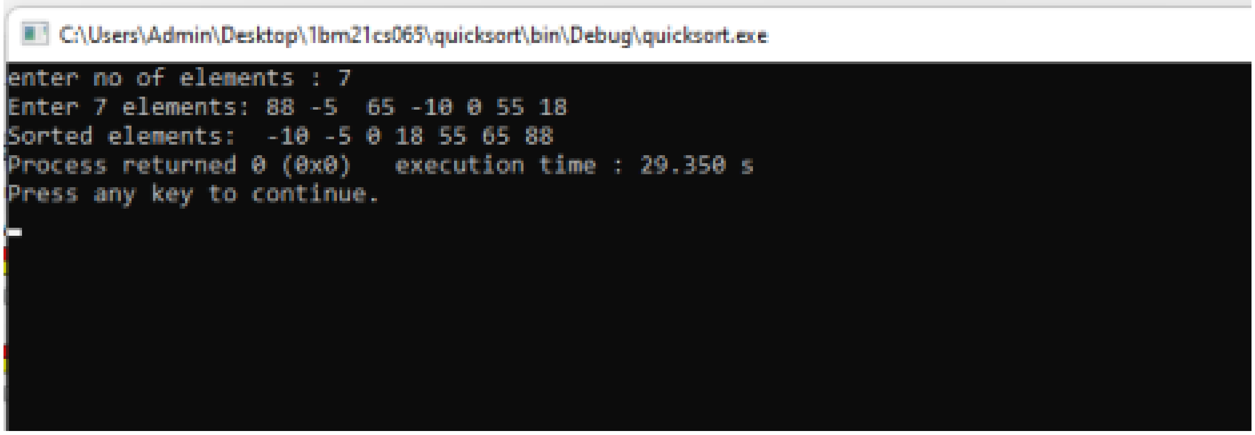
Sort a given set of N integer elements using Quick Sort technique.

CODE:

```
#include<stdio.h>

void quicksort(int number[25],int first,int last)
 {
   int i, j, pivot, temp;
   if(first<last)
    {
      pivot=first;
      i=first;
      j=last;
      while(i<j)
       {
         while(number[i]<=number[pivot]&&i<last)
         i++;
         while(number[j]>number[pivot])
         j--;
         if(i<j)
          {
            temp=number[i];
            number[i]=number[j];
            number[j]=temp;
          }
        }
        temp=number[pivot];
        number[pivot]=number[j];
        number[j]=temp;
        quicksort(number,first,j-1);
        quicksort(number,j+1,last);
    }
```

```
}
int main()
{
int i, count, number[25];
printf("enter no of elements : ");
scanf("%d",&count);
printf("Enter %d elements: ", count);
for(i=0;i<count;i++)
scanf("%d",&number[i]);
quicksort(number,0,count-1);
printf("Sorted elements: ");
for(i=0;i<count;i++)
printf(" %d",number[i]);
return 0;
}
```

OUTPUT:



C:\Users\Admin\Desktop\1bm21cs065\quicksort\bin\Debug\quicksort.exe

```
enter no of elements : 7
Enter 7 elements: 88 -5  65 -10 0 55 18
Sorted elements:  -10 -5 0 18 55 65 88
Process returned 0 (0x0)   execution time : 29.350 s
Press any key to continue.
```

WEEK 6

Implement 0/1 Knapsack problem using dynamic programming.

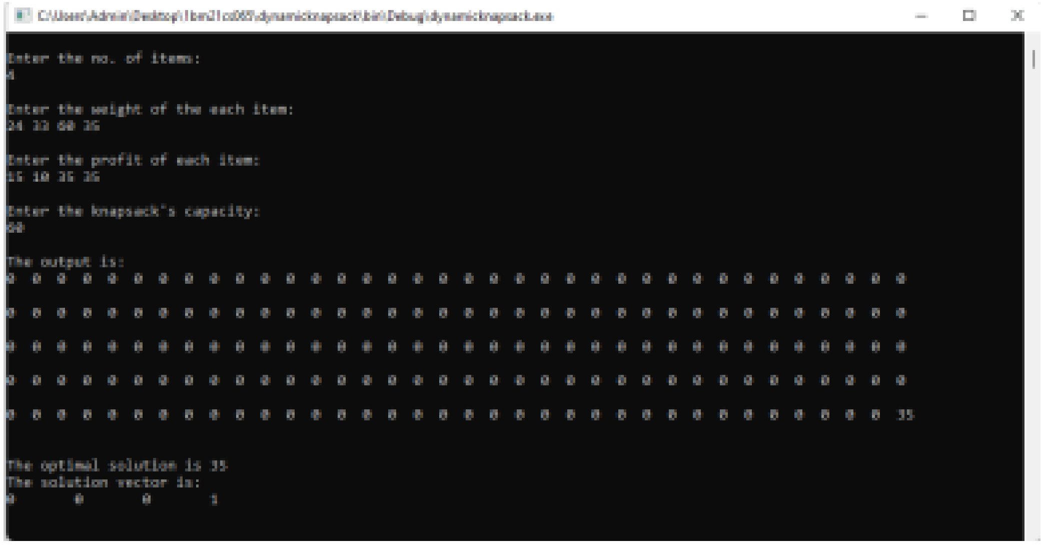
CODE:

```
#include <stdio.h>
#include <conio.h>
void knapsack();
int max(int, int);
int i, j, n, m, p[10], w[10], v[10][10];
void main()
{
   printf("\nEnter the no. of items:\n");
   scanf("%d", &n);
   printf("\nEnter the weight of the each item:\n");
   for (i = 1; i <= n; i++)
    {
       scanf("%d", &w[i]);
    }
   printf("\nEnter the profit of each item:\n");
   for (i = 1; i <= n; i++)
    {
       scanf("%d", &p[i]);
    }
    printf("\nEnter the knapsack's capacity:\n");
    scanf("%d", &m);
    knapsack();
    getch();
}
void knapsack()
{
    int x[10];
    for (i = 0; i <= n; i++)
    {
```

```
        for (j = 0; j <= m; j++)
        {
            if (i == 0 || j == 0)
            {
                v[i][j] = 0;
            }
            else if (j - w[i] < 0)
            {
                v[i][j] = v[i - 1][j];
            }
            else
            {
                v[i][j] = max(v[i - 1][j], v[i - 1][j - w[i]] + p[i]);
            }
        }
    }
    printf("\nThe output is:\n");
    for (i = 0; i <= n; i++)

    {
        for (j = 0; j <= m; j++)
        {
            printf("%d ", v[i][j]);
        }
        printf("\n\n");
    }
    printf("\nThe optimal solution is %d", v[n][m]);
    printf("\nThe solution vector is:\n");
    for (i = n; i >= 1; i--)
    {
        if (v[i][m] != v[i - 1][m])
        {
            x[i] = 1;
            m = m - w[i];
```

```
        }
        else
        {
            x[i]=0;
        }
    }
    for(i=1;i<=n;i++)
    {
        printf("%d\t",x[i]);
    }
}
intmax(intx,inty)
{
    if(x>y)
    {
        returnx;
    }
    else
    {
        returny;
    }
}
```

OUTPUT:



C:\Users\Admin\Desktop\1bm21cs065\dynamicknapsack\bin\Debug\dynamicknapsack.exe

```
Enter the no. of items:
4

Enter the weight of the each item:
24 33 60 35

Enter the profit of each item:
15 10 35 35

Enter the knapsack's capacity:
60

The output is:
0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0

0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0

0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0

0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0

0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  35


The optimal solution is 35
The solution vector is:
0       0       0       1
```

WEEK 7

Implement All Pair Shortest paths problem using Floyd's algorithm.

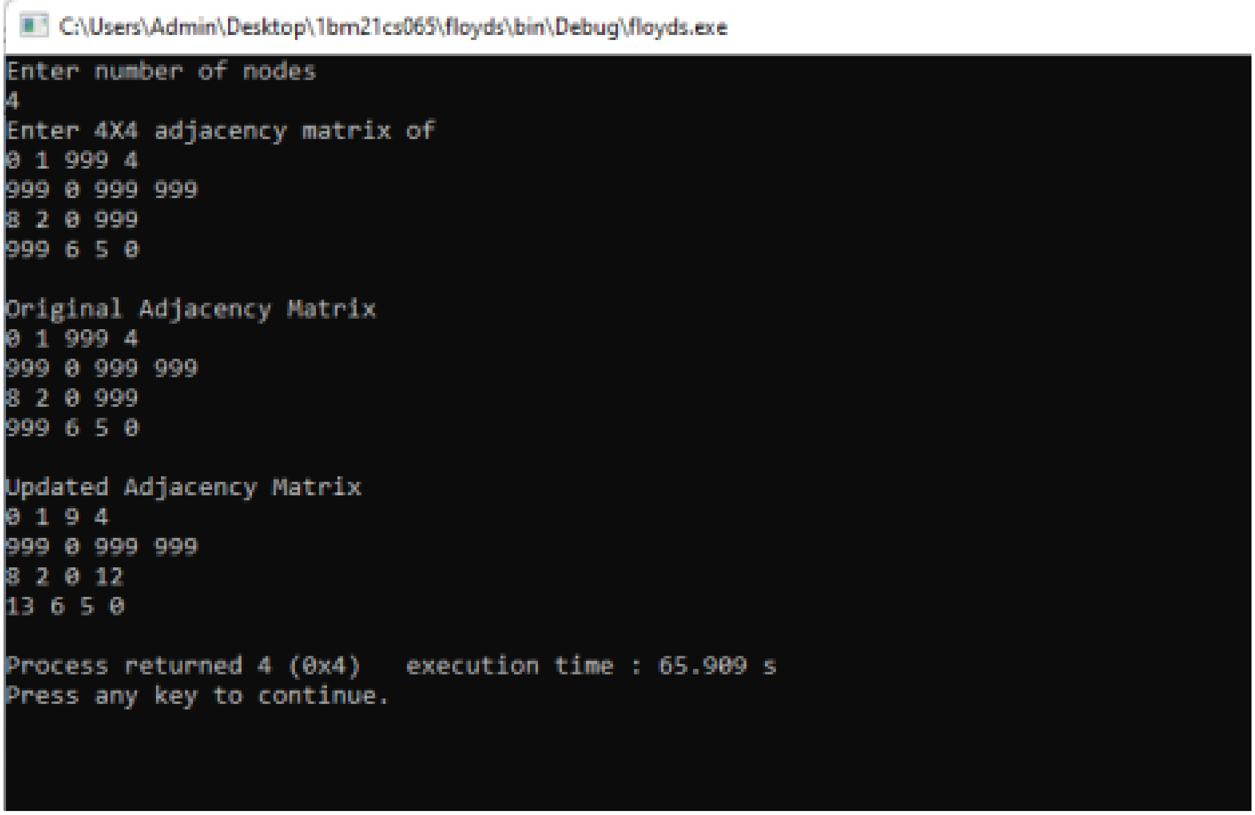
CODE:

```
#include<stdio.h>

void main()
{
   int i,j,k,n,p[10][10],o[10][10];

   printf("Enter number of nodes \n");
   scanf("%d",&n);

   printf("Enter %dX%d adjacency matrix of \n",n,n);
   for(i=0;i<n;i++)
    {
       for(j=0;j<n;j++)
       scanf("%d",&p[i][j]);
    }

   for(i=0;i<n;i++)
   for(j=0;j<n;j++)
   o[i][j]=p[i][j];
```

```
    for(k=0;k<n;k++)
    for(i=0;i<n;i++)
    for(j=0;j<n;j++)
    if(p[i][j] > p[k][j]+p[i][k])
    p[i][j]=p[k][j]+p[i][k];

    printf("\nOriginal Adjacency Matrix \n");
    for(i=0;i<n;i++)
     {
```

```
for(j=0;j<n;j++)
printf("%d ",o[i][j]);
printf("\n");
}

printf("\nUpdated Adjacency Matrix \n");
for(i=0;i<n;i++)
{
for(j=0;j<n;j++)
printf("%d ",p[i][j]);
printf("\n");
}
}
```

OUTPUT:



C:\Users\Admin\Desktop\1bm21cs065\floyds\bin\Debug\floyds.exe

```
Enter number of nodes
4
Enter 4X4 adjacency matrix of
0 1 999 4
999 0 999 999
8 2 0 999
999 6 5 0

Original Adjacency Matrix
0 1 999 4
999 0 999 999
8 2 0 999
999 6 5 0

Updated Adjacency Matrix
0 1 9 4
999 0 999 999
8 2 0 12
13 6 5 0

Process returned 4 (0x4)   execution time : 65.909 s
Press any key to continue.
```

WEEK 8

Find the minimum cost spanning tree of a given undirected graph using prims and Kruskal's algorithm.

PRIMS:

CODE:

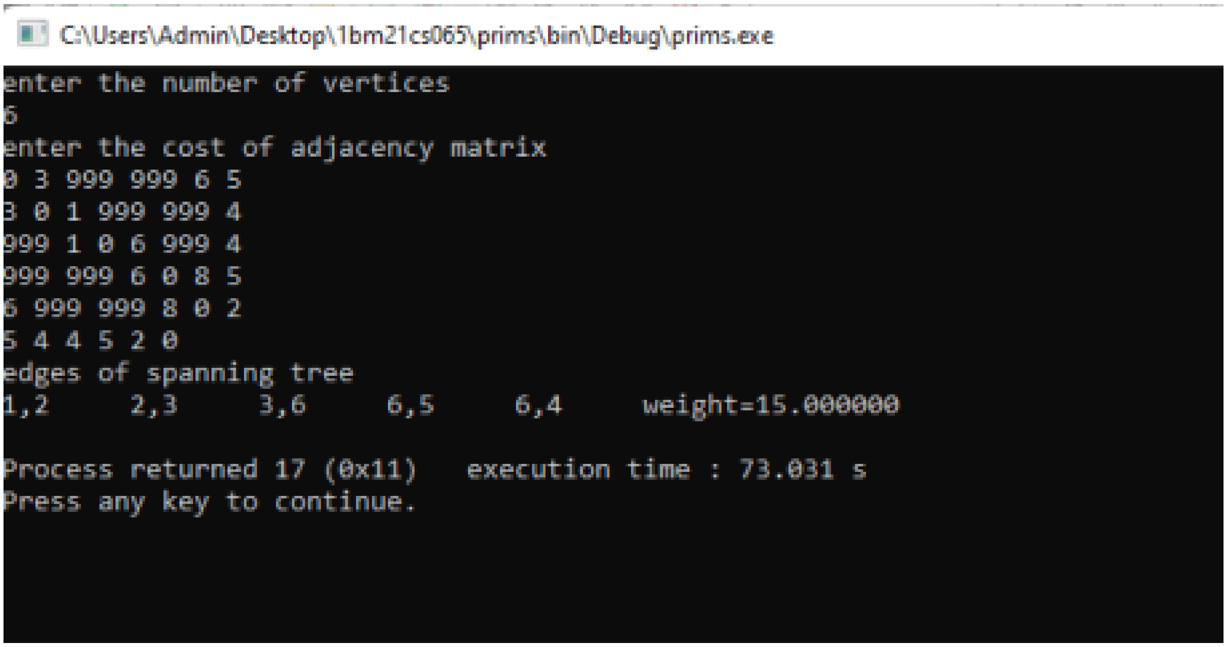
```
#include<stdio.h>


float cost[10][10];
int vt[10],et[10][10],vis[10],j,n;
float sum=0;
int x=1;
int e=0;
void prims();
void main()
 {
   int i;

   printf("enter the number of vertices\n");
    scanf("%d",&n);
   printf("enter the cost of adjacency matrix\n");
   for(i=1;i<=n;i++)
    {
       for(j=1;j<=n;j++)
        {
            scanf("%f",&cost[i][j]);
        }
       vis[i]=0;
     }
    prims();
```

```
    printf("edgesofspanningtree\n");
    for(i=1;i<=e;i++)
     {
          printf("%d,%d\t",et[i][0],et[i][1]);
     }
    printf("weight=%f\n",sum);

 }

voidprims()
 {
   ints,m,k,u,v;
   floatmin;
   vt[x]=1;
   vis[x]=1;
   for(s=1;s<n;s++)
    {
```

```
j=x;
min=999;
while(j>0)
 {
      k=vt[j];
      for(m=2;m<=n;m++)
       {
        if(vis[m]==0)
         {
             if(cost[k][m]<min)
              {
                min=cost[k][m];
                u=k;
                v=m;
              }
          }
     }
```

```
j--;
}
vt[++x]=v;
et[s][0]=u;
et[s][1]=v;
e++;
vis[v]=1;
sum=sum+min;
}
}
```

OUTPUT:



```
enter the number of vertices
6
enter the cost of adjacency matrix
0 3 999 999 6 5
3 0 1 999 999 4
999 1 0 6 999 4
999 999 6 0 8 5
6 999 999 8 0 2
5 4 4 5 2 0
edges of spanning tree
1,2     2,3     3,6     6,5     6,4     weight=15.000000

Process returned 17 (0x11)   execution time : 73.031 s
Press any key to continue.
```

KRUSHKAL'S:

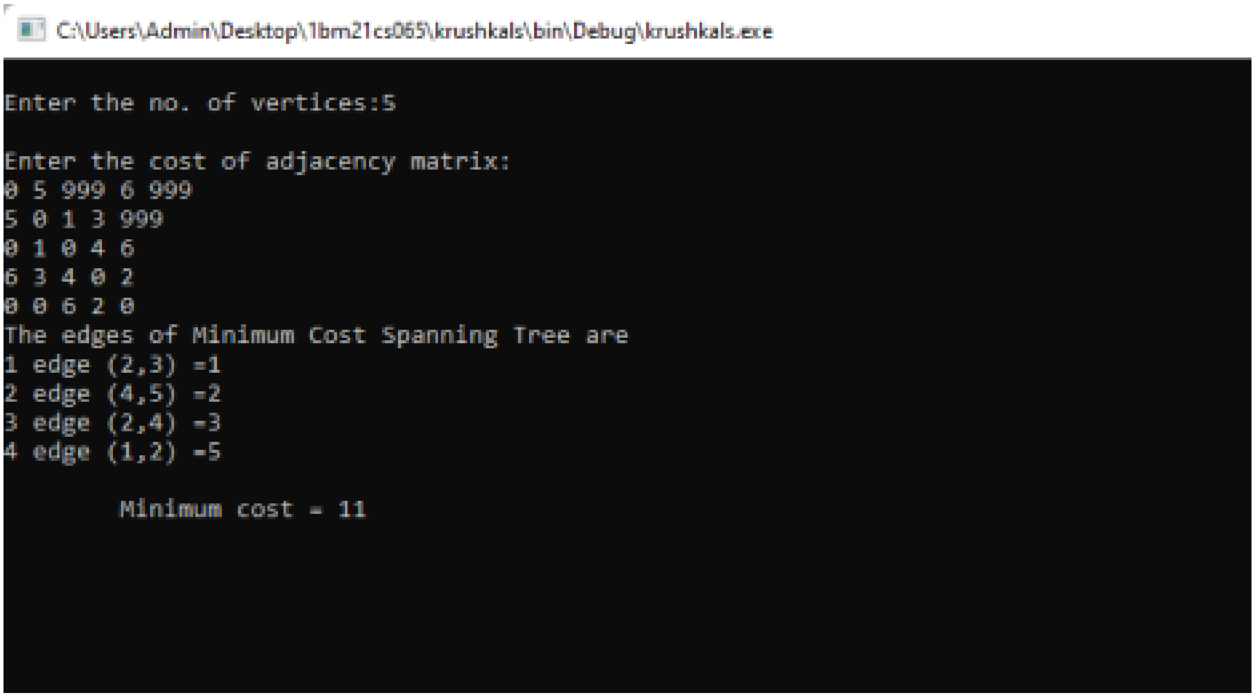
CODE:

```
#include <stdio.h>
#include <conio.h>
#include <stdlib.h>
int i,j,k,a,b,u,v,n,ne=1;
int min,mincost=0,cost[9][9],parent[9];
int find(int);
int uni(int,int);
void main()
 {
   printf("\nEnter the no. of vertices:");
   scanf("%d",&n);
   printf("\nEnter the cost of adjacency matrix:\n");
   for(i=1;i<=n;i++)
    {
      for(j=1;j<=n;j++)
       {
        scanf("%d",&cost[i][j]);
        if(cost[i][j]==0)
```

```
         cost[i][j]=999;
       }
    }
    printf("The edges of Minimum Cost Spanning Tree are\n");
    while(ne < n)
     {
      for(i=1,min=999;i<=n;i++)
       {
        for(j=1;j <= n;j++)
         {
          if(cost[i][j] < min)
```

```
           {
            min=cost[i][j];
            a=u=i;
            b=v=j;
           }
         }
       }
      u=find(u);
      v=find(v);
      if(uni(u,v))
       {
        printf("%dedge(%d,%d)=%d\n",ne++,a,b,min);
        mincost+=min;
       }
      cost[a][b]=cost[b][a]=999;
    }
    printf("\nMinimumcost=%d\n",mincost);
    getch();
}
intfind(inti)
 {
   while(parent[i])
   i=parent[i];
   returni;
}
intuni(inti,intj)
 {
  if(i!=j)
   {
   parent[j]=i;
   return1;
   }
  return0;
}
```

OUTPUT:



C:\Users\Admin\Desktop\1bm21cs065\krushkals\bin\Debug\krushkals.exe

```
Enter the no. of vertices:5

Enter the cost of adjacency matrix:
0 5 999 6 999
5 0 1 3 999
0 1 0 4 6
6 3 4 0 2
0 0 6 2 0
The edges of Minimum Cost Spanning Tree are
1 edge (2,3) =1
2 edge (4,5) =2
3 edge (2,4) =3
4 edge (1,2) =5

        Minimum cost = 11
```

WEEK 9

From a given vertex in a weighted connected graph, find shortest paths to

other vertices using dijkstra's algorithm.

CODE:

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

void dijkstra(int G[MAX][MAX],int n,int startnode);
int main()
 {
  int G[MAX][MAX],i,j,n,u;
  printf("Enter no. of vertices:");
  scanf("%d",&n);
  printf("\nEnter the adjacency matrix:\n");
  for(i=0;i<n;i++)
  for(j=0;j<n;j++)
  scanf("%d",&G[i][j]);
  printf("\nEnter the starting node:");
  scanf("%d",&u);
  dijkstra(G,n,u);
  return 0;
}
void dijkstra(int G[MAX][MAX],int n,int startnode)
 {
  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(G[i][j]==0)
  cost[i][j]=INFINITY;
```

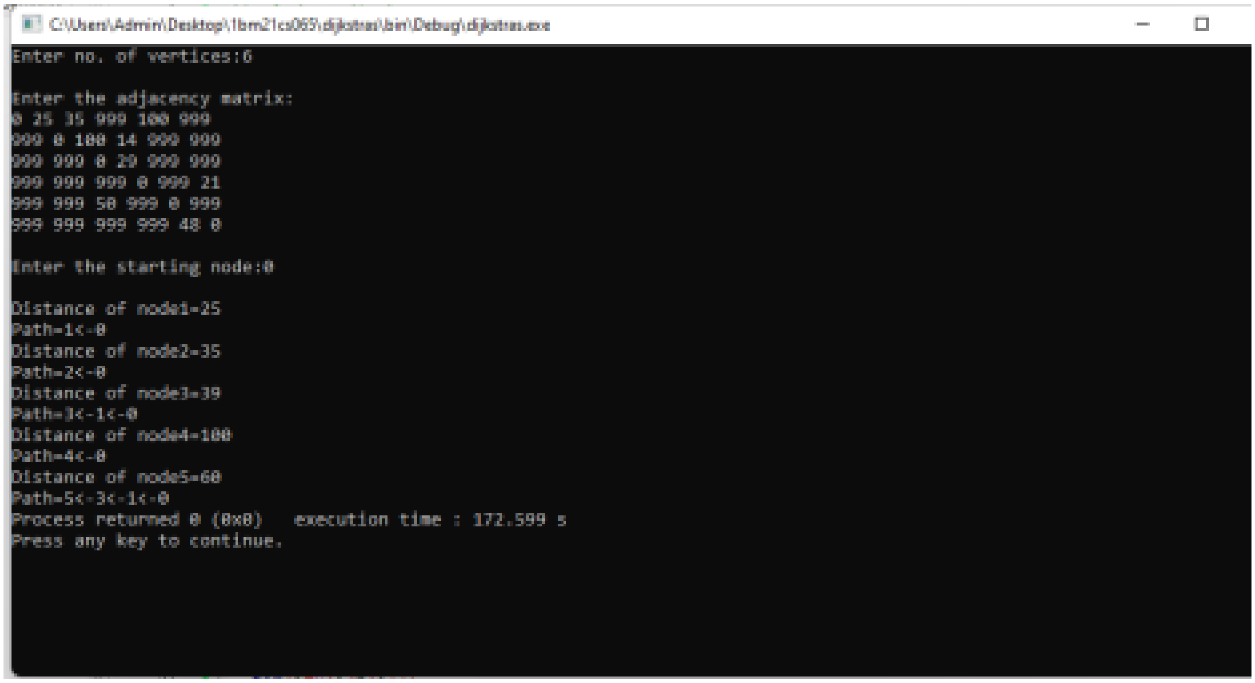
```
  else
  cost[i][j]=G[i][j];
  for(i=0;i<n;i++)
```

```
   {
    distance[i]=cost[startnode][i];
    pred[i]=startnode;
    visited[i]=0;
  }
  distance[startnode]=0;
  visited[startnode]=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!=startnode)
 {
```

```
printf("\nDistance of node%d=%d",i,distance[i]);
printf("\nPath=%d",i);
```

```
j=i;
do
{
j=pred[j];
printf("<-%d",j);
}
while(j!=startnode);
}
}
```

OUTPUT:


C:\Users\Admin\Desktop\1bm21cs063\dijkstras\bin\Debug\dijkstras.exe

```
Enter no. of vertices:6

Enter the adjacency matrix:
0 25 35 999 100 999
999 0 100 14 999 999
999 999 0 20 999 999
999 999 999 0 999 21
999 999 50 999 0 999
999 999 999 999 48 0

Enter the starting node:0

Distance of node1=25
Path=1<-0
Distance of node2=35
Path=2<-0
Distance of node3=39
Path=3<-1<-0
Distance of node4=100
Path=4<-0
Distance of node5=60
Path=5<-3<-1<-0
Process returned 0 (0x0)   execution time : 172.599 s
Press any key to continue.
```

WEEK 10

Implement “N-Queens Problem” using Backtracking.

CODE:

```
#include<stdio.h>
#include<math.h>
```

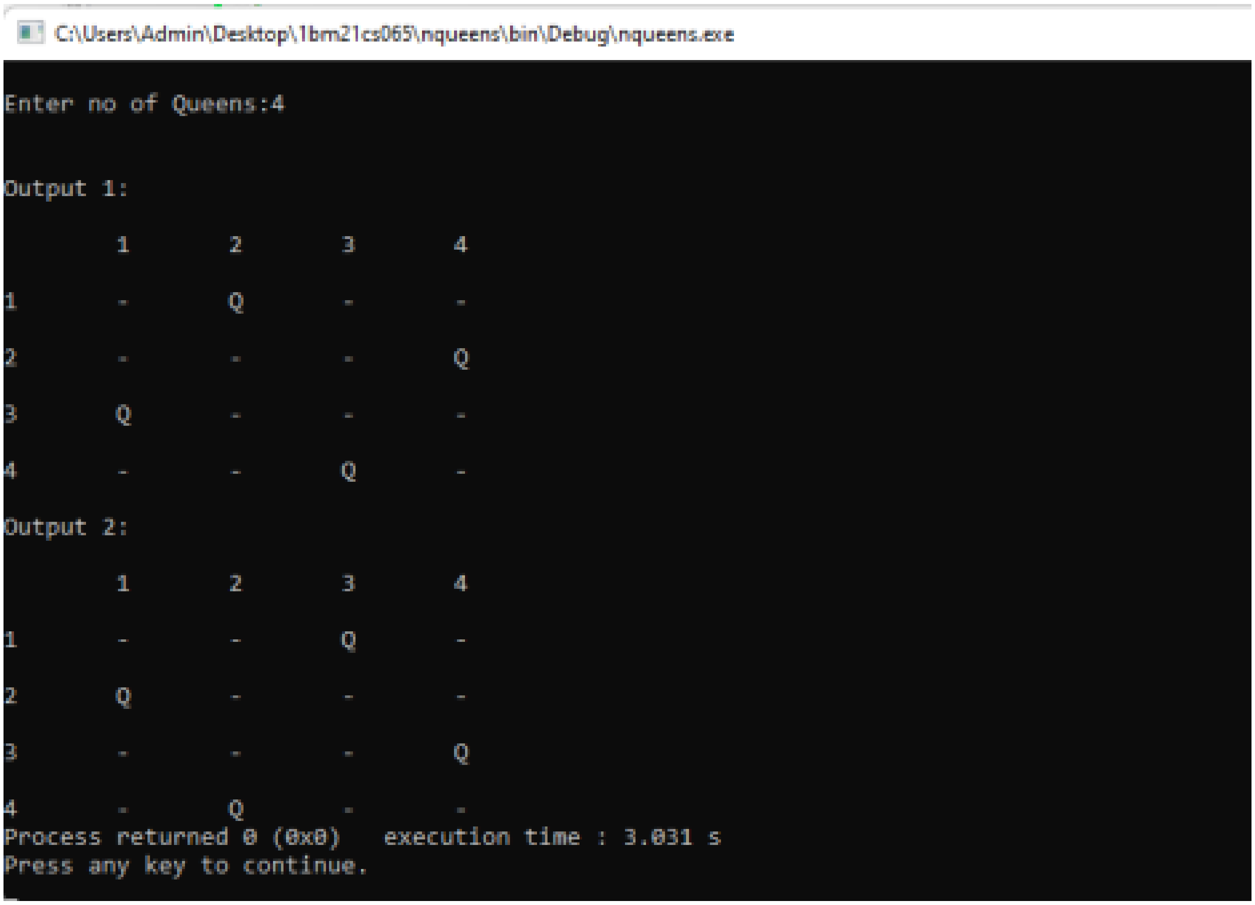
```
int board[20],count;

int main()
 {
int n,i,j;
void queen(int row,int n);
printf("\n\nEnter no of Queens:");
scanf("%d",&n);
queen(1,n);
return 0;
}

void print(int n)
 {
int i,j;
printf("\n\nOutput %d:\n\n",++count);

for(i=1;i<=n;++i)
  printf("\t%d",i);

for(i=1;i<=n;++i)
 {
  printf("\n\n%d",i);
  for(j=1;j<=n;++j)
   {
```

```
   if(board[i]==j)
    printf("\tQ");
   else
    printf("\t-");
  }
}
}
intplace(introw,intcolumn)
```

```
 {
inti;
for(i=1;i<=row-1;++i)
 {
  if(board[i]==column)
   return0;
  else
   if(abs(board[i]-column)==abs(i-row))
    return0;
 }

return1;
 }

voidqueen(introw,intn)
 {
intcolumn;
for(column=1;column<=n;++column)
 {
  if(place(row,column))
   {
   board[row]=column;
   if(row==n)
    print(n);
   else
    queen(row+1,n);
```

```
 }
 }
 }
```

OUTPUT:



C:\Users\Admin\Desktop\1bm21cs065\nqueens\bin\Debug\nqueens.exe

```
Enter no of Queens:4

Output 1:

        1       2       3       4

1       -       Q       -       -

2       -       -       -       Q

3       Q       -       -       -

4       -       -       Q       -

Output 2:

        1       2       3       4

1       -       -       Q       -

2       Q       -       -       -

3       -       -       -       Q

4       -       Q       -       -
Process returned 0 (0x0)   execution time : 3.031 s
Press any key to continue.
```

WEEK 11

Sort a given set of N integer elements using Heap Sort technique.

CODE:

```
#include <stdio.h>

void heapify(int arr[], int n, int i) {
    int largest = i, left = 2 * i + 1, right = 2 * i + 2;
    if (left < n && arr[left] > arr[largest])
        largest = left;
    if (right < n && arr[right] > arr[largest])
        largest = right;
    if (largest != i) {
        int temp = arr[i];
        arr[i] = arr[largest];
        arr[largest] = temp;
        heapify(arr, n, largest);
    }
}

void heapsort(int arr[], int n) {
    for (int i = n / 2 - 1; i >= 0; i--)
        heapify(arr, n, i);
    for (int i = n - 1; i >= 0; i--) {
        int temp = arr[0];
        arr[0] = arr[i];
        arr[i] = temp;
        heapify(arr, i, 0);
    }
}

int main() {
    int arr[10], n, i;
```

```
printf("Enter number of elements \n");
scanf("%d", &n);
printf("Enter %d elements \n", n);
for (i = 0; i < n; i++)
scanf("%d", &arr[i]);
heapsort(arr, n);

printf("\nSorted array: ");
for (i = 0; i < n; i++)
printf("%d ", arr[i]);

return 0;
}
```

OUTPUT:

[39]