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Q2.Write a non recursive C program to implement inorder , preorder and postorder traversal for a BST.

PROGRAM:

```
#include<stdio.h>

#include<stdlib.h>

#define MAX 50 struct

node

{       struct node

*left;

    int info;       struct

node *right;

};


struct node *insert(struct node *root, int ele );

void preorder(struct node *root); void

inorder(struct node *root); void

postorder(struct node *root); void

display(struct node *ptr,int level);

struct node *queue[MAX];

int front=-1,rear=-1; void

enqueue(struct node *item);

struct node *DeQue(); int

Qempty();


struct node *stack[MAX]; int

top=-1; void Push(struct

node *item); struct node

*Pop(); int StkEmt();


int main( )
```

```
{
    struct node *root=NULL;
    int x,y, ele;
while(y=1)
    {
        printf("\n 1.Insert");
printf("\n 2.Display");
printf("\n 3.Preorder");
printf("\n 4.Inorder");
printf("\n 5.Postorder");
printf("\n 6.Exit ");
printf("\n Choose option:");
scanf("%d",&x);         switch(x)
        {
case 1:
            printf("\nEnter Element : ");
scanf("%d",&ele);             root =
insert(root, ele);
            break;

        case 2:
            printf("\n\t");
display(root,0);
printf("\n\t");             break;
         case
3:
            preorder(root);
            break;
        case 4:
inorder(root);
break;

        case 5:
postorder(root);
            break;
         case 6:
exit(1);
y=0;

        default:
            printf("\nWrong Input!!!x\n");
        }
    }
    return 0;
}



struct node *insert(struct node *root, int ele)
{
    struct node *tmp,*p,*ptr;
    ptr = root;     p
= NULL;      while(
ptr!=NULL)
    {         p
= ptr;
        if(ele < ptr->info) ptr
            = ptr->left;
        else
ptr = ptr->right;
    }
    tmp=(struct node *)malloc(sizeof(struct node));
tmp->info=ele;      tmp->left=NULL;      tmp-
>right=NULL;      if(p==NULL)          root=tmp;
else if( ele < p->info )          p->left=tmp;      else
p->right=tmp;      return root;
}
void preorder(struct node *root)
{
    struct node *ptr = root;
if( ptr==NULL )
    {
        printf("Tree is empty\n");
return;
    }
    printf("\n Pre-order : ");
Push(ptr);                 while(
!StkEmt() )
    {
        ptr = Pop();
printf("%d  ",ptr->info);
        if(ptr->right!=NULL)
            Push(ptr->right);
        if(ptr->left!=NULL)
            Push(ptr->left);
    }
    printf("\t");
}
```

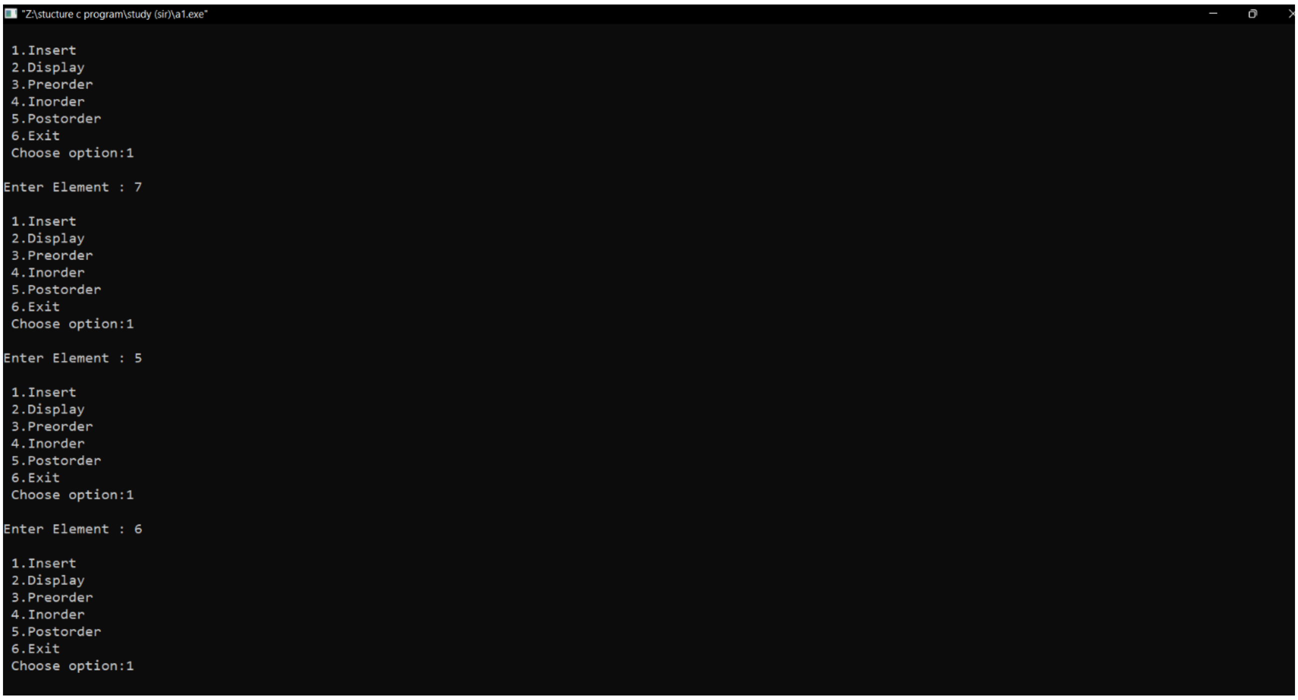
```
void inorder(struct node *root)
{
    struct node *ptr=root;

    if( ptr==NULL )
    {
        printf("Tree is empty\n");
        return;
    }
    printf("\n In-order : ");
while(1)
    {
      while(ptr->left!=NULL )
        {
            Push(ptr);
ptr = ptr->left;
        }
        while( ptr->right==NULL )
        {
            printf("%d  ",ptr->info);
if(StkEmt())                return;
ptr = Pop();
        }
        printf("%d  ",ptr->info);
ptr = ptr->right;

    }
}
void postorder(struct node *root)
{
    struct node *ptr = root;
struct node *q;      if(
ptr==NULL )
    {
        printf("Tree is empty\n");
return;
    }
    q = root;        printf("\n
Post-order : ");      while(1)
    {
        while(ptr->left!=NULL)
        {
            Push(ptr);
ptr=ptr->left;
        }
        while( ptr->right==NULL || ptr->right==q )
        {
            printf("%d  ",ptr->info);
q = ptr;                   if( StkEmt() )
return;                  ptr = Pop();
        }
        Push(ptr);
ptr = ptr->right;
    }
    printf("\t");
}
void enqueue(struct node *item)
{
    if(rear==MAX-1)
    {
            printf("queue Overflow\n");
            return;
      }
      if(front==-1)
front=0;
rear=rear+1;
queue[rear]=item ;
}
struct node *DeQue()
{
      struct node *item;
if(front==-1 || front==rear+1)
      {
            printf("queue Underflow\n");
            return 0;
      }
      item=queue[front];
front=front+1;        return
item;
}
int Qempty()
{
      if(front==-1 || front==rear+1)
            return 1;
else
            return 0;
}
void Push(struct node *item)
{
        if(top==(MAX-1))
        {
                printf("stack Overflow\n");
                return;
        }
        top=top+1;
stack[top]=item;
}
struct node *Pop()
{
        struct node *item;
if(top==-1)
        {
                printf("stack Underflow....\n");
                exit(1);
        }
        item=stack[top];
top=top-1;         return
item;
}
int StkEmt()
{
        if(top==-1)
return 1;         else
return 0;
}
void display(struct node *ptr,int level)
{         int
i;
```

```
    if(ptr == NULL )
return;       else
    {
        display(ptr->right, level+1);
printf("\n\t");               for (i=0;
i<level; i++)
            printf("    ");
printf("%d", ptr->info);
display(ptr->left, level+1);
    }
}
```

OUTPUT:-



```
 1.Insert
 2.Display
 3.Preorder
 4.Inorder
 5.Postorder
 6.Exit
 Choose option:1

Enter Element : 7

 1.Insert
 2.Display
 3.Preorder
 4.Inorder
 5.Postorder
 6.Exit
 Choose option:1

Enter Element : 5

 1.Insert
 2.Display
 3.Preorder
 4.Inorder
 5.Postorder
 6.Exit
 Choose option:1

Enter Element : 6

 1.Insert
 2.Display
 3.Preorder
 4.Inorder
 5.Postorder
 6.Exit
 Choose option:1
```

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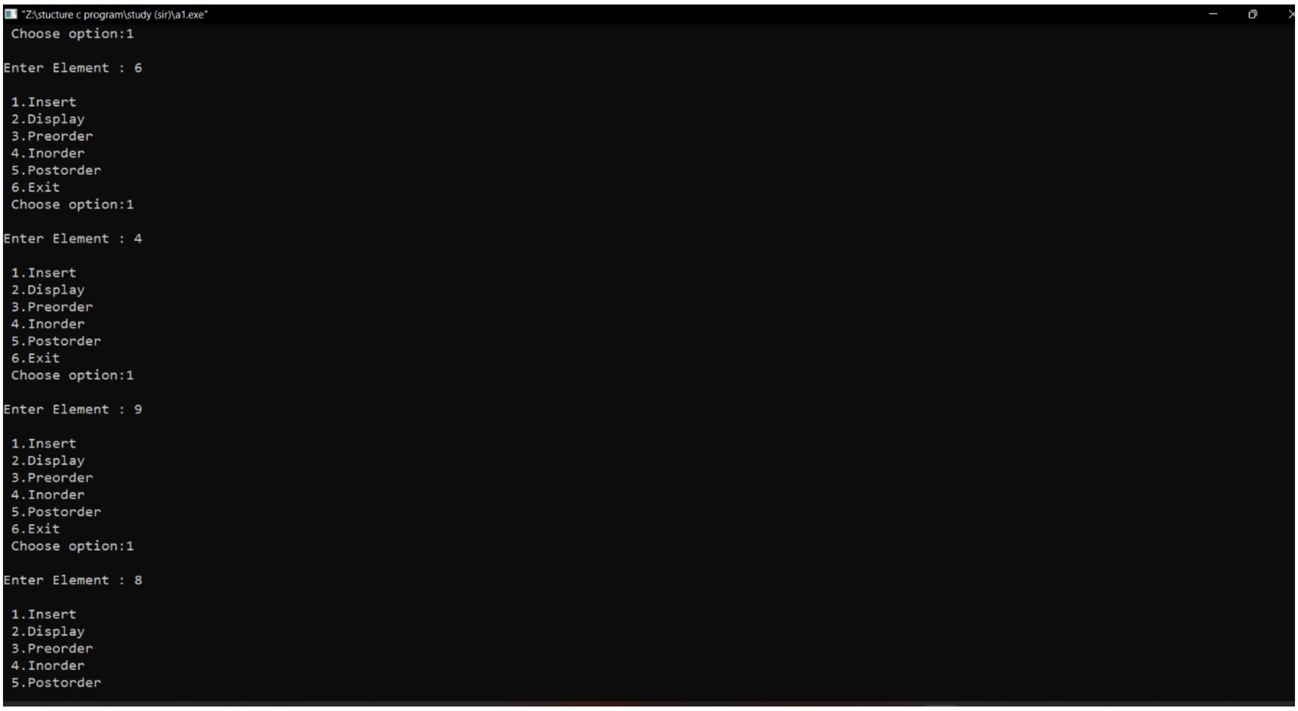
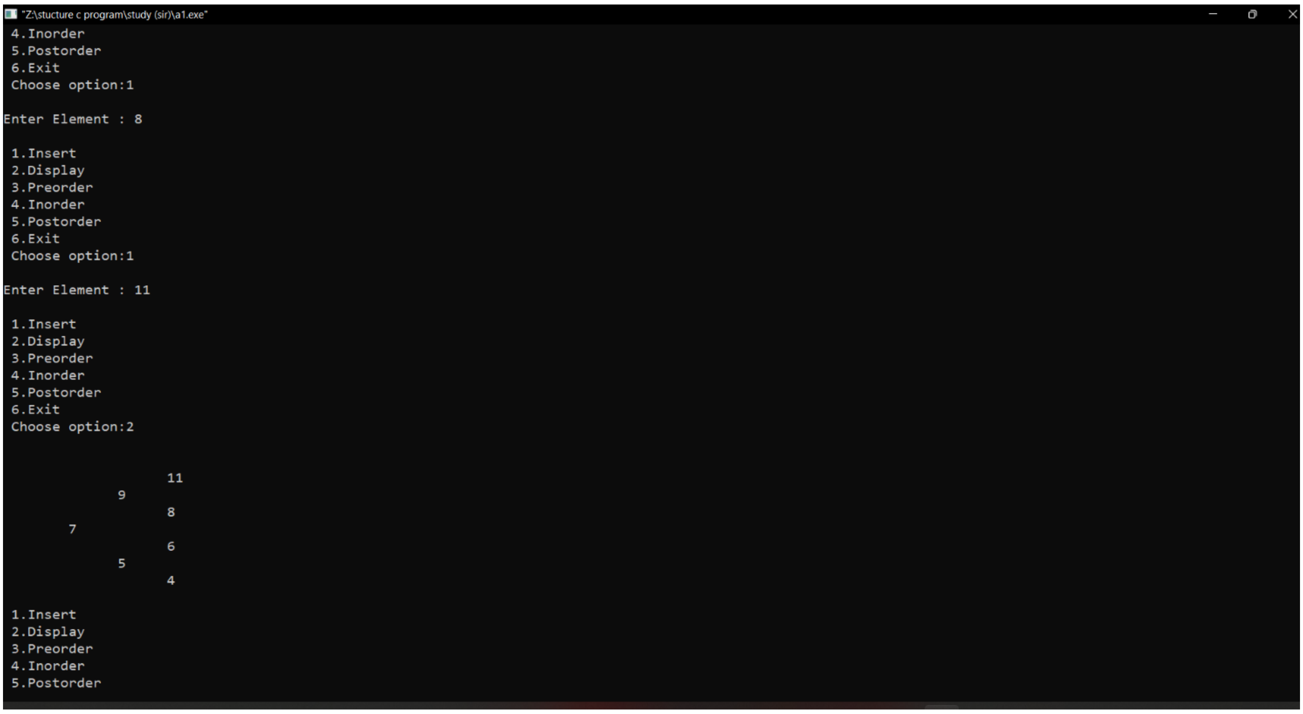
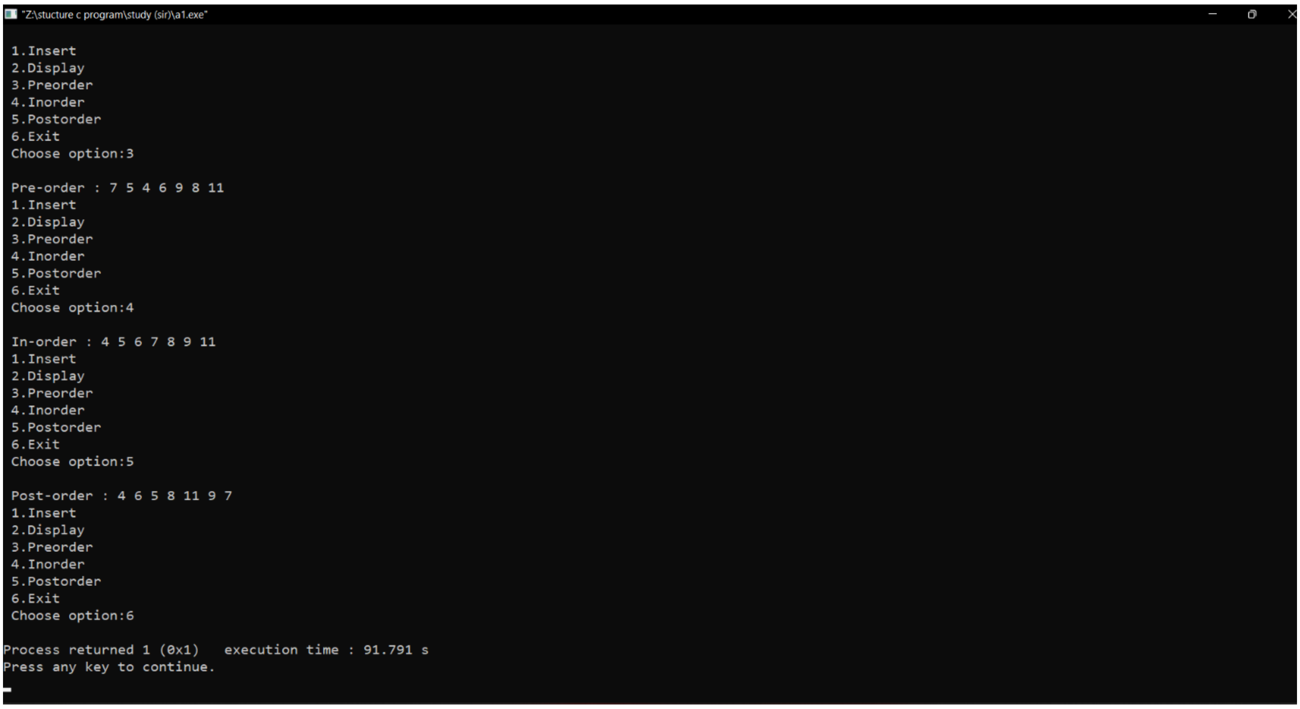


```
 Choose option:1

Enter Element : 6

 1.Insert
 2.Display
 3.Preorder
 4.Inorder
 5.Postorder
 6.Exit
 Choose option:1

Enter Element : 4

 1.Insert
 2.Display
 3.Preorder
 4.Inorder
 5.Postorder
 6.Exit
 Choose option:1

Enter Element : 9

 1.Insert
 2.Display
 3.Preorder
 4.Inorder
 5.Postorder
 6.Exit
 Choose option:1

Enter Element : 8

 1.Insert
 2.Display
 3.Preorder
 4.Inorder
 5.Postorder
```



```
 4.Inorder
 5.Postorder
 6.Exit
 Choose option:1

Enter Element : 8

 1.Insert
 2.Display
 3.Preorder
 4.Inorder
 5.Postorder
 6.Exit
 Choose option:1

Enter Element : 11

 1.Insert
 2.Display
 3.Preorder
 4.Inorder
 5.Postorder
 6.Exit
 Choose option:2


                    11
              9
                    8
        7
                    6
              5
                    4

 1.Insert
 2.Display
 3.Preorder
 4.Inorder
 5.Postorder
```



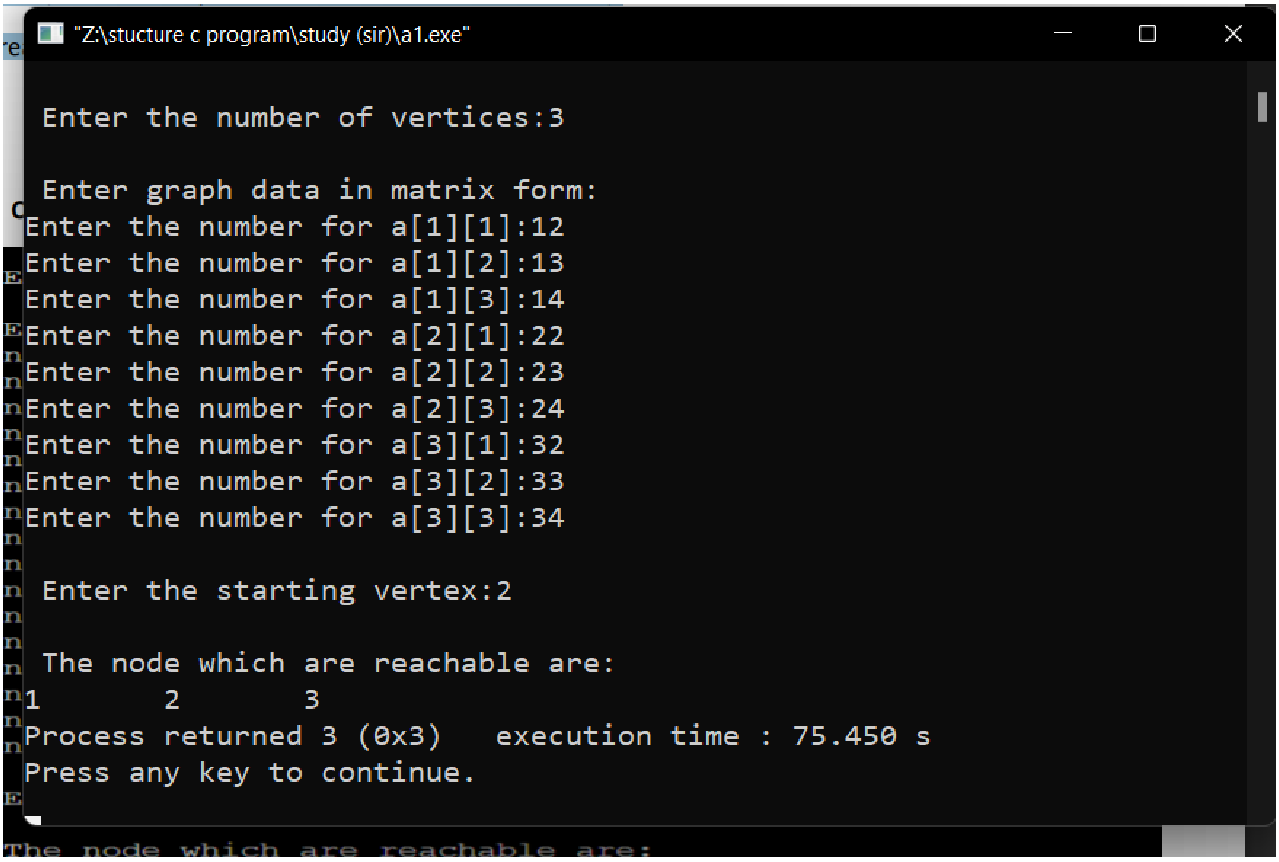
```
 1.Insert
 2.Display
 3.Preorder
 4.Inorder
 5.Postorder
 6.Exit
 Choose option:3

 Pre-order : 7 5 4 6 9 8 11
 1.Insert
 2.Display
 3.Preorder
 4.Inorder
 5.Postorder
 6.Exit
 Choose option:4

 In-order : 4 5 6 7 8 9 11
 1.Insert
 2.Display
 3.Preorder
 4.Inorder
 5.Postorder
 6.Exit
 Choose option:5

 Post-order : 4 6 5 8 11 9 7
 1.Insert
 2.Display
 3.Preorder
 4.Inorder
 5.Postorder
 6.Exit
 Choose option:6

Process returned 1 (0x1)   execution time : 91.791 s
Press any key to continue.
```

Q3.Write C program to implement Depth first search and Breadth first search traversals of a graph.

BFS PROGRAM:

```
#include<stdio.h> #include<stdlib.h> int
a[20][20], q[20], visited[20], n, i, j, f = 0, r = -1;


void bfs(int v) {  for(i =
1; i <= n; i++)  if(a[v][i]
&& !visited[i])  q[++r] =
i;  if(f <= r) {
visited[q[f]] = 1;
bfs(q[f++]);
 }
}


void main() {
 int v;  printf("\n Enter the number of
vertices:");  scanf("%d", &n);

 for(i=1; i <= n; i++) {
q[i] = 0;  visited[i] =
0;
 }

 printf("\n Enter graph data in matrix form:\n");
 for(i=1; i<=n; i++) {  for(j=1;j<=n;j++) {
printf("Enter the number for a[%d][%d]:",i,j);
scanf("%d",&a[i][j]);
 }
 }

 printf("\n Enter the starting vertex:");
scanf("%d", &v);
 bfs(v);  printf("\n The node which are reachable
are:\n");

 for(i=1; i <= n; i++) {
if(visited[i])
printf("%d\t", i);  else
{
 printf("\n Bfs is not possible. Not all nodes are reachable");
break;
 }
 }
}
```

OUTPUT:



```
 Enter the number of vertices:3

 Enter graph data in matrix form:
Enter the number for a[1][1]:12
Enter the number for a[1][2]:13
Enter the number for a[1][3]:14
Enter the number for a[2][1]:22
Enter the number for a[2][2]:23
Enter the number for a[2][3]:24
Enter the number for a[3][1]:32
Enter the number for a[3][2]:33
Enter the number for a[3][3]:34

 Enter the starting vertex:2

 The node which are reachable are:
1       2       3
Process returned 3 (0x3)   execution time : 75.450 s
Press any key to continue.
```

DFS PROGRAM:

```
include<stdio.h>

#include<conio.h> int

a[20][20],reach[20],n;

void dfs(int v)

{  int

i;

 reach[v]=1;

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

if(a[v][i] && !reach[i])

  {

   printf("\n %d->%d",v,i);

   dfs(i);
  }
}
void main()
{
 int i,j,count=0;  printf("\n Enter
number of vertices:");
scanf("%d",&n);  for(i=1;i<=n;i++)
 {
  reach[i]=0;
for(j=1;j<=n;j++)
   a[i][j]=0;
 }
 printf("\n Enter the adjacency matrix:\n");
for(i=1;i<=n;i++)   for(j=1;j<=n;j++)
scanf("%d",&a[i][j]);  dfs(1);

 printf("\n");
for(i=1;i<=n;i++)
 {
  if(reach[i])
count++;
 }
 if(count==n)   printf("\n Graph is
connected");
 else   printf("\n Graph is not
connected");
}
```

OUTPUT:

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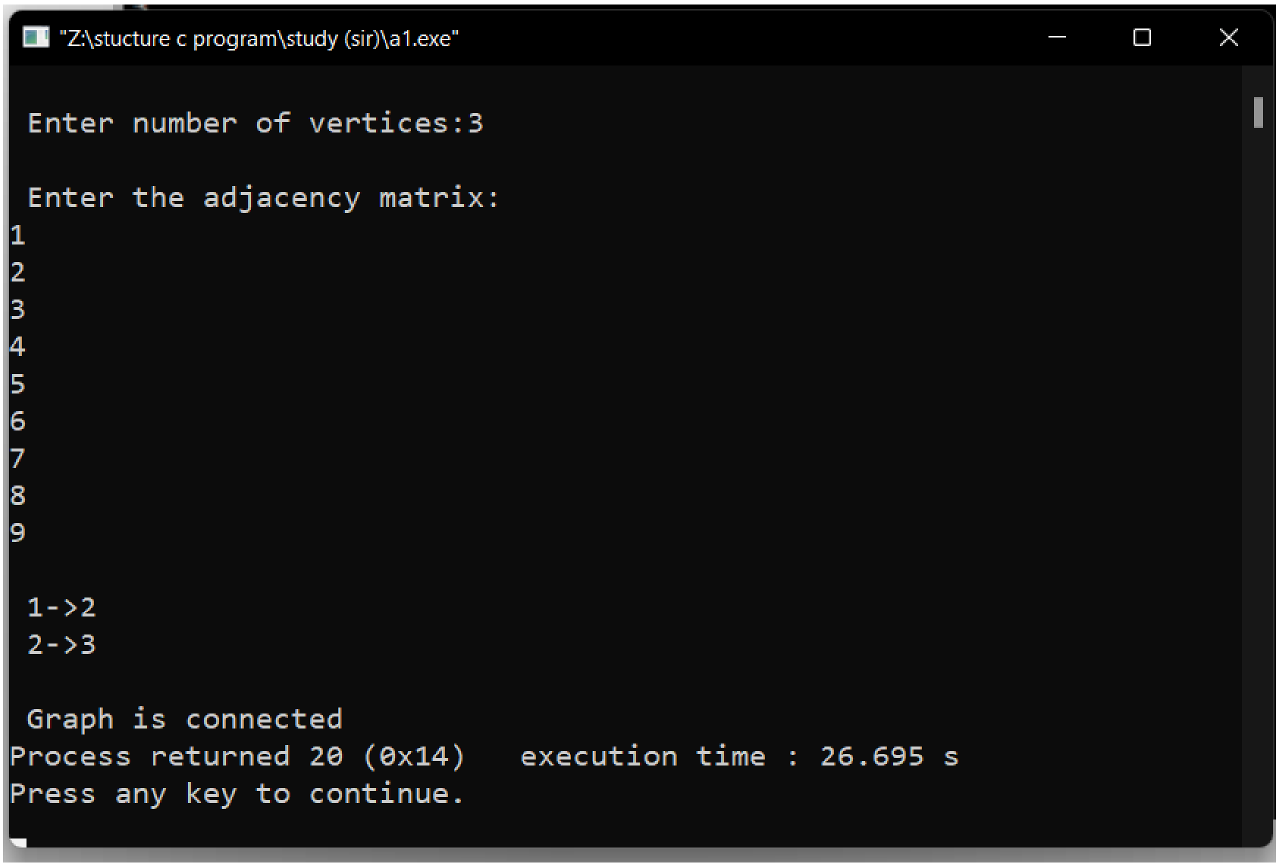

```
 Enter number of vertices:3

 Enter the adjacency matrix:
1
2
3
4
5
6
7
8
9


 1->2
 2->3

 Graph is connected
Process returned 20 (0x14)   execution time : 26.695 s
Press any key to continue.
```