Graph traversal BFS

```
#include<stdio.h>

#include<stdlib.h>


#define MAX 100


#define initial 1

#define waiting 2

#define visited 3


int n; /*Number of vertices in the
graph*/

int adj[MAX][MAX]; /*Adjacency
Matrix*/

int state[MAX]; /*can be initial,
waiting or visited*/


void create_graph();

void BF_Traversal();
```

```
void BFS(int v);


int queue[MAX], front = -1,rear = -
1;

void insert_queue(int vertex);

int delete_queue();

int isEmpty_queue();


int main()

{

 create_graph();

 BF_Traversal();


 return 0;


}/*End of main()*/


void BF_Traversal()

{
```

```
 int v;

 for(v=0; v<n; v++)
 state[v] = initial;

 printf("\nEnter starting vertex for
Breadth First Search : ");
 scanf("%d", &v);
 BFS(v);
}/*End of BF_Traversal()*/

void BFS(int v)
{
 int i;

 insert_queue(v);
 state[v] = waiting;

 while(!isEmpty_queue())
```

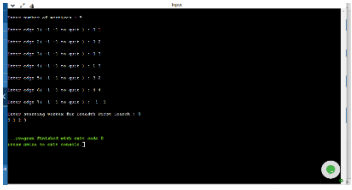
```
{
v = delete_queue( );
printf("%d ",v);
state[v] = visited;

for(i=0; i<n; i++)
{
/*Check for adjacent unvisited
vertices */
if(adj[v][i] == 1 && state[i] ==
initial)
{
insert_queue(i);
state[i] = waiting;
}
}
}
printf("\n");
}/*End of BFS()*/
```

```
void insert_queue(int vertex)

{

 if(rear == MAX-1)

 printf("\nQueue Overflow\n");

 else

 {

 if(front == -1) /*If queue is initially
empty */

 front = 0;

 rear = rear+1;

 queue[rear] = vertex ;

 }

}/*End of insert_queue()*/


int isEmpty_queue()

{

 if(front == -1 || front > rear)

 return 1;
```

```
 else
 return 0;
}/*End of isEmpty_queue()*/

int delete_queue()
{
 int del_item;
 if(front == -1 || front > rear)
 {
 printf("\nQueue Underflow\n");
 exit(1);
 }

 del_item = queue[front];
 front = front+1;
 return del_item;
}/*End of delete_queue() */
```

```
void create_graph()

{

 int i,max_edges,origin,destin;


 printf("\nEnter number of vertices
: ");

 scanf("%d",&n);

 max_edges = n*(n-1);


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

 {

 printf("\nEnter edge %d( -1 -1 to
quit ) : ",i);

 scanf("%d %d",&origin,&destin);


 if((origin == -1) && (destin == -1))

 break;


 if(origin>=n || destin>=n ||
origin<0 || destin<0)
```

```
{
printf("\nInvalid edge!\n");
i--;
}
else
{
adj[origin][destin] = 1;
}
}
}
```



Graph traversal DFS:

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

```
#define MAX 100


#define initial 1

#define visited 2


int n;    /* Number of nodes in the
graph */

int adj[MAX][MAX]; /*Adjacency
Matrix*/

int state[MAX]; /*Can be initial or
visited */


void DF_Traversal();

void DFS(int v);

void create_graph();


int stack[MAX];

int top = -1;

void push(int v);

int pop();
```

```
int isEmpty_stack();


main()

{

        create_graph();

        DF_Traversal();

}/*End of main()*/


void DF_Traversal()

{

        int v;


        for(v=0; v<n; v++)

                state[v]=initial;


        printf("\nEnter starting node
for Depth First Search : ");

        scanf("%d",&v);

        DFS(v);
```

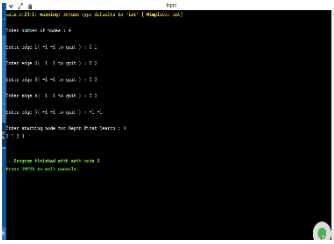
```
        printf("\n");
}/*End of DF_Traversal( )*/


void DFS(int v)
{
        int i;
        push(v);
        while(!isEmpty_stack())
        {
                v = pop();
                if(state[v]==initial)
                {
                        printf("%d ",v);
                        state[v]=visited;
                }
                for(i=n-1; i>=0; i--)
                {
                        if(adj[v][i]==1 &&
state[i]==initial)
```

```
                        push(i);
            }
        }
}/*End of DFS( )*/


void push(int v)
{
        if(top == (MAX-1))
        {
            printf("\nStack
Overflow\n");
            return;
        }
        top=top+1;
        stack[top] = v;


}/*End of push()*/


int pop()
```

```
{
        int v;
        if(top == -1)
        {
                printf("\nStack
Underflow\n");
                exit(1);
        }
        else
        {
                v = stack[top];
                top=top-1;
                return v;
        }
}/*End of pop()*/


int isEmpty_stack( )
{
  if(top == -1)
```

```
        return 1;
  else
        return 0;
}/*End if isEmpty_stack()*/


void create_graph()
{
      int i,max_edges,origin,destin;


      printf("\nEnter number of
nodes : ");
      scanf("%d",&n);
      max_edges=n*(n-1);


      for(i=1;i<=max_edges;i++)
      {
            printf("\nEnter edge %d( -
1 -1 to quit ) : ",i);
            scanf("%d
%d",&origin,&destin);
```

```
            if( (origin == -1) && (destin
== -1) )
                    break;


            if( origin >= n || destin >=
n || origin<0 || destin<0)
            {
                    printf("\nInvalid
edge!\n");
                    i--;
            }
            else
            {
                    adj[origin][destin] = 1;
            }
    }
}
```



Topoligical sorting:

```
#include<stdio.h>

#include<stdlib.h>


#define MAX 100


int n;    /*Number of vertices in the graph*/

int adj[MAX][MAX]; /*Adjacency Matrix*/

void create_graph();
```

```
int queue[MAX], front = -1,rear = -
1;

void insert_queue(int v);

int delete_queue();

int isEmpty_queue();



int indegree(int v);



int main()

{

	int
i,v,count,topo_order[MAX],indeg[
MAX];



	create_graph();



	/*Find the indegree of each
vertex*/

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

	{
```

```
            indeg[i] = indegree(i);

            if( indeg[i] == 0 )

                insert_queue(i);

        }


        count = 0;


        while(  !isEmpty_queue( ) &&
count < n )

        {

            v = delete_queue();

        topo_order[++count] = v;
/*Add vertex v to topo_order
array*/

            /*Delete all edges going
fron vertex v */

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

            {

                if(adj[v][i] == 1)

                {
```

```
                        adj[v][i] = 0;

                        indeg[i] =
indeg[i]-1;

                        if(indeg[i] == 0)


insert_queue(i);

                    }

            }

        }



        if( count < n )

        {

            printf("\nNo topological
ordering possible, graph contains
cycle\n");

            exit(1);

        }

        printf("\nVertices in
topological order are :\n");

        for(i=1; i<=count; i++)
```

```
            printf( "%d ",topo_order[i]
);

        printf("\n");


        return 0;

}/*End of main()*/


void insert_queue(int vertex)

{

        if (rear == MAX-1)

            printf("\nQueue
Overflow\n");

        else

        {

            if (front == -1)  /*If queue
is initially empty */

                front = 0;

            rear = rear+1;

            queue[rear] = vertex ;

        }
```

```
}/*End of insert_queue()*/


int isEmpty_queue()

{

	if(front == -1 || front > rear )

		return 1;

	else

		return 0;

}/*End of isEmpty_queue()*/


int delete_queue()

{

	int del_item;

	if (front == -1 || front > rear)

	{

		printf("\nQueue
Underflow\n");

		exit(1);

	}
```

```
        else
        {
                del_item = queue[front];
                front = front+1;
                return del_item;
        }
}/*End of delete_queue() */


int indegree(int v)
{
        int i,in_deg = 0;
        for(i=0; i<n; i++)
                if(adj[i][v] == 1)
                        in_deg++;
        return in_deg;
}/*End of indegree() */


void create_graph()
```

```
{
    int i,max_edges,origin,destin;

    printf("\nEnter number of
vertices : ");
    scanf("%d",&n);
    max_edges = n*(n-1);

    for(i=1; i<=max_edges; i++)
    {
        printf("\nEnter edge %d(-1
-1 to quit): ",i);
        scanf("%d
%d",&origin,&destin);

        if((origin == -1) && (destin
== -1))
            break;
```

```
            if( origin >= n || destin >=
n || origin<0 || destin<0)
            {
                printf("\nInvalid
edge!\n");
                i--;
            }
            else
                adj[origin][destin] = 1;
        }
}
```