Bansilal Ramnath Agarwal Charitable Trust's

Vishwakarma Institute of Technology

(An Autonomous Institute affiliated to Savitribai Phule Pune University)

Data Structure Lab

Assignment No: 6

Name : Gourav Balaji Suram

Roll No : 39

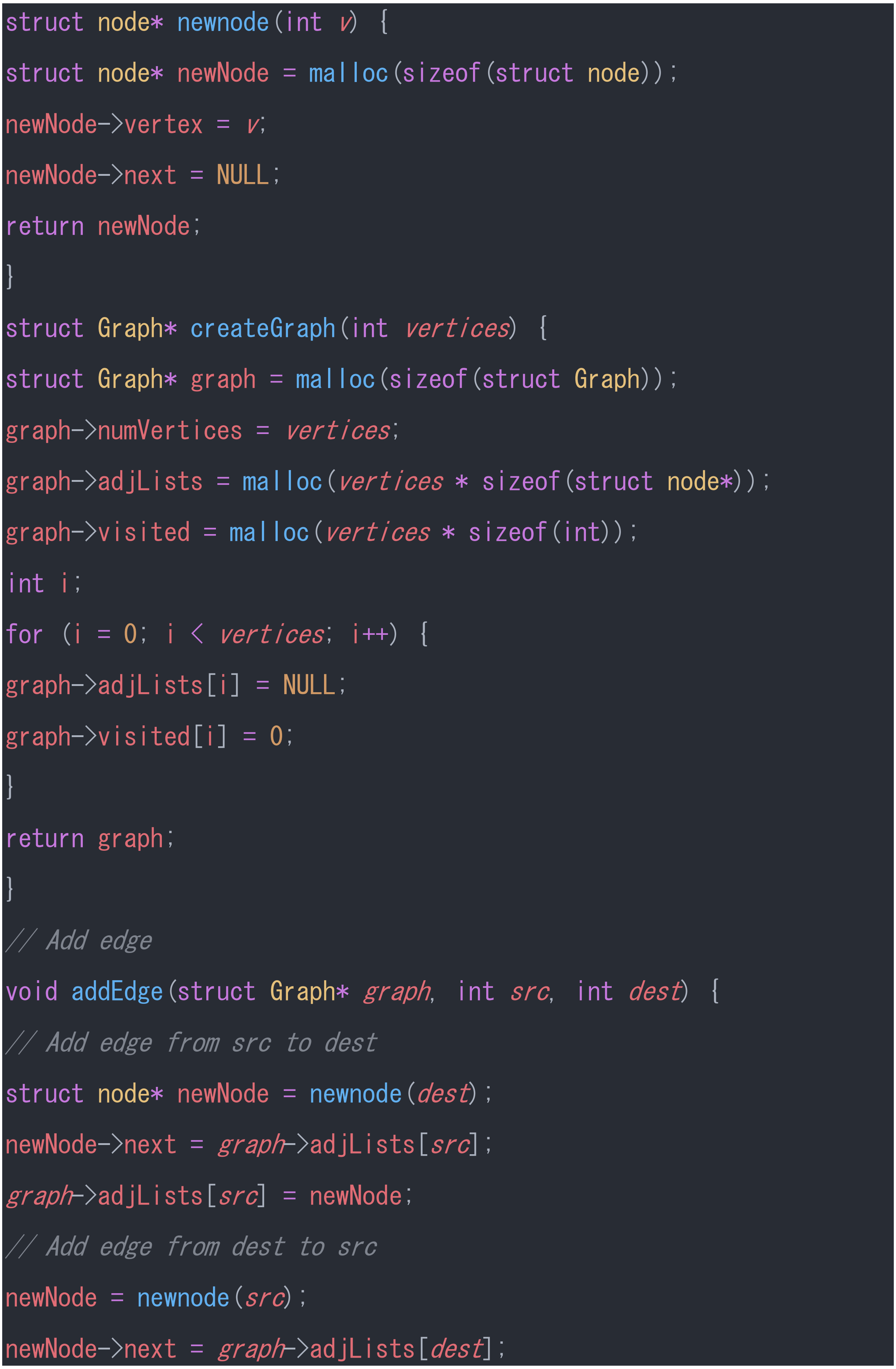
PRN No : 12220032

Problem Statement:

Implement BFS and DFS traversal on graph.

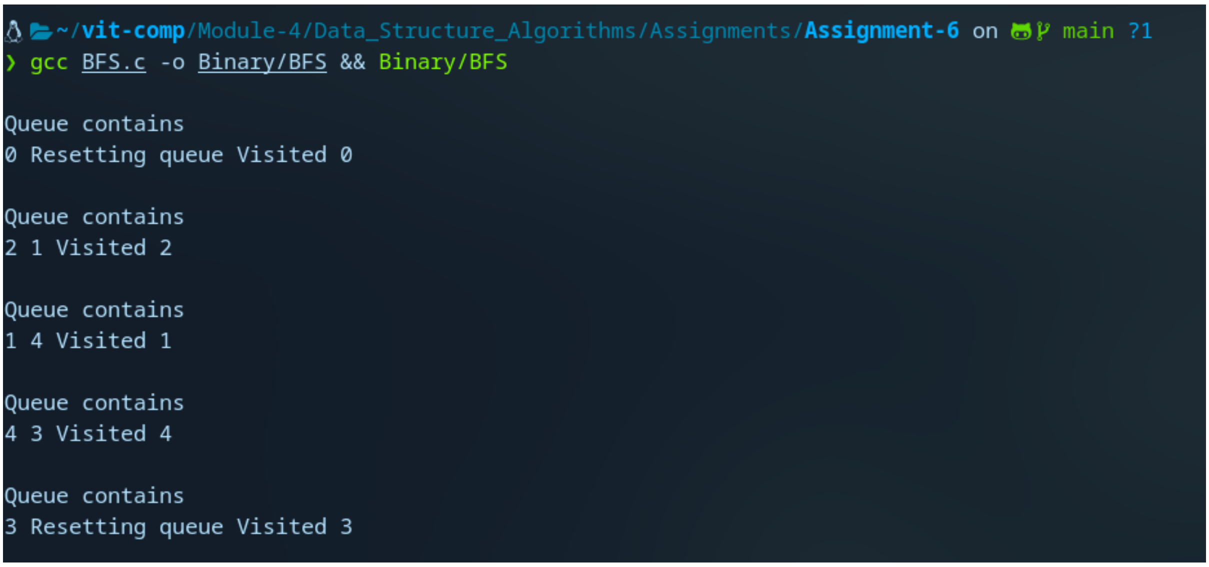
1. BFS Implemenation

```
#include <stdio.h>
#include <stdlib.h>
struct node {
int vertex;
struct node* next;
};
struct node* newnode(int v);
struct Graph {
int numVertices;
int* visited;
struct node** adjLists;
};
void DFS(struct Graph* graph, int vertex) {
struct node* adjList = graph->adjLists[vertex];
struct node* temp = adjList;
graph->visited[vertex] = 1;
printf(”Visited %d ¥n”, vertex);
while (temp != NULL) {
int connectedVertex = temp->vertex;
if (graph->visited[connectedVertex] == 0) {
DFS(graph, connectedVertex);
}
temp = temp->next;
}
}
```



```
struct node* newnode(int v) {
struct node* newNode = malloc(sizeof(struct node));
newNode->vertex = v;
newNode->next = NULL;
return newNode;
}
struct Graph* createGraph(int vertices) {
struct Graph* graph = malloc(sizeof(struct Graph));
graph->numVertices = vertices;
graph->adjLists = malloc(vertices * sizeof(struct node*));
graph->visited = malloc(vertices * sizeof(int));
int i;
for (i = 0; i < vertices; i++) {
graph->adjLists[i] = NULL;
graph->visited[i] = 0;
}
return graph;
}
// Add edge
void addEdge(struct Graph* graph, int src, int dest) {
// Add edge from src to dest
struct node* newNode = newnode(dest);
newNode->next = graph->adjLists[src];
graph->adjLists[src] = newNode;
// Add edge from dest to src
newNode = newnode(src);
newNode->next = graph->adjLists[dest];
graph->adjLists[dest] = newNode;
}
// Print the graph
void printGraph(struct Graph* graph) {
int v;
for (v = 0; v < graph->numVertices; v++) {
struct node* temp = graph->adjLists[v];
printf(”¥n Adjacency list of vertex %d¥n ”, v);
while (temp) {
printf(”%d -> ”, temp->vertex);
temp = temp->next;
}
printf(”¥n”);
}
}
int main() {
struct Graph* graph = createGraph(4);
addEdge(graph, 0, 1);
addEdge(graph, 0, 2);
addEdge(graph, 1, 2);
addEdge(graph, 2, 3);
printGraph(graph);
DFS(graph, 2);
return 0;
}
```

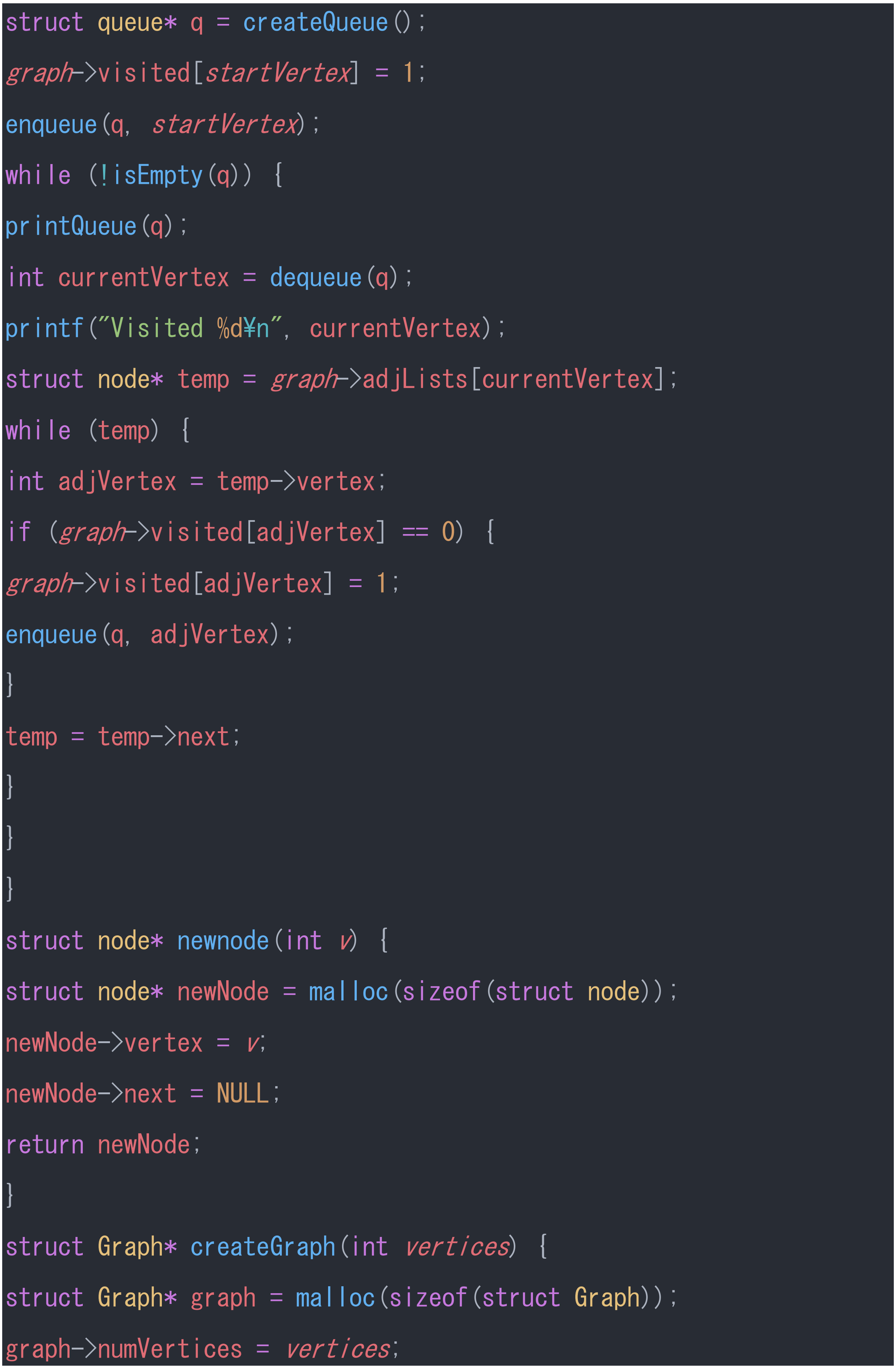
OUTPUT



```
~/vit-comp/Module-4/Data_Structure_Algorithms/Assignments/Assignment-6 on  main ?1
❯ gcc BFS.c -o Binary/BFS && Binary/BFS

Queue contains
0 Resetting queue Visited 0

Queue contains
2 1 Visited 2

Queue contains
1 4 Visited 1

Queue contains
4 3 Visited 4

Queue contains
3 Resetting queue Visited 3
```

2. DFS Implemenation

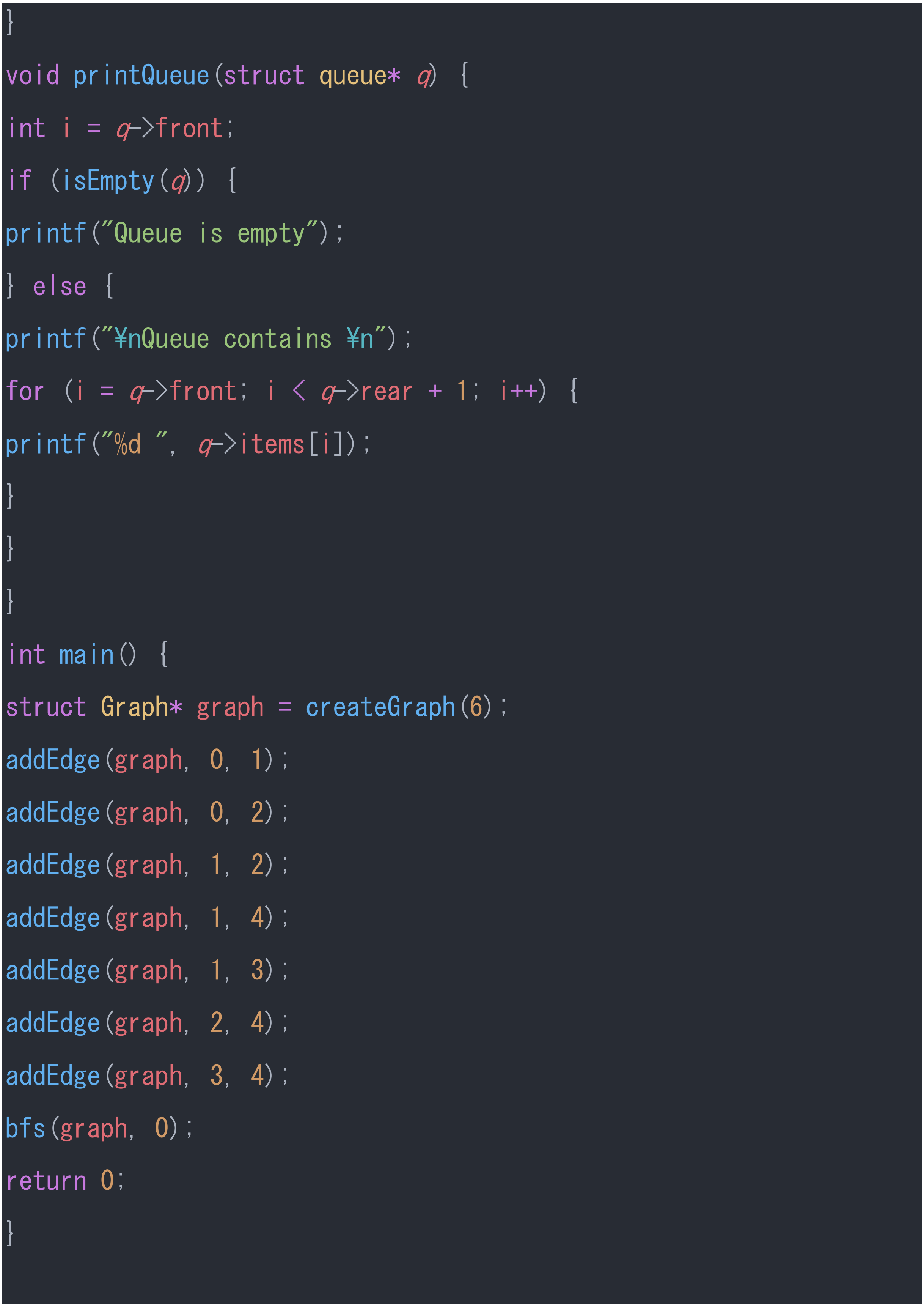
```
#include <stdio.h>
#include <stdlib.h>
#define SIZE 40
struct queue {
int items[SIZE];
int front;
int rear;
};
struct queue* createQueue();
void enqueue(struct queue* q, int);
int dequeue(struct queue* q);
void display(struct queue* q);
int isEmpty(struct queue* q);
void printQueue(struct queue* q);
struct node {
int vertex;
struct node* next;
};
struct node* newnode(int);
struct Graph {
int numVertices;
struct node** adjLists;
int* visited;
};
void bfs(struct Graph* graph, int startVertex) {
```



```
struct queue* q = createQueue();
graph->visited[startVertex] = 1;
enqueue(q, startVertex);
while (!isEmpty(q)) {
printQueue(q);
int currentVertex = dequeue(q);
printf(”Visited %d¥n”, currentVertex);
struct node* temp = graph->adjLists[currentVertex];
while (temp) {
int adjVertex = temp->vertex;
if (graph->visited[adjVertex] == 0) {
graph->visited[adjVertex] = 1;
enqueue(q, adjVertex);
}
temp = temp->next;
}
}
}
struct node* newnode(int v) {
struct node* newNode = malloc(sizeof(struct node));
newNode->vertex = v;
newNode->next = NULL;
return newNode;
}
struct Graph* createGraph(int vertices) {
struct Graph* graph = malloc(sizeof(struct Graph));
graph->numVertices = vertices;
```

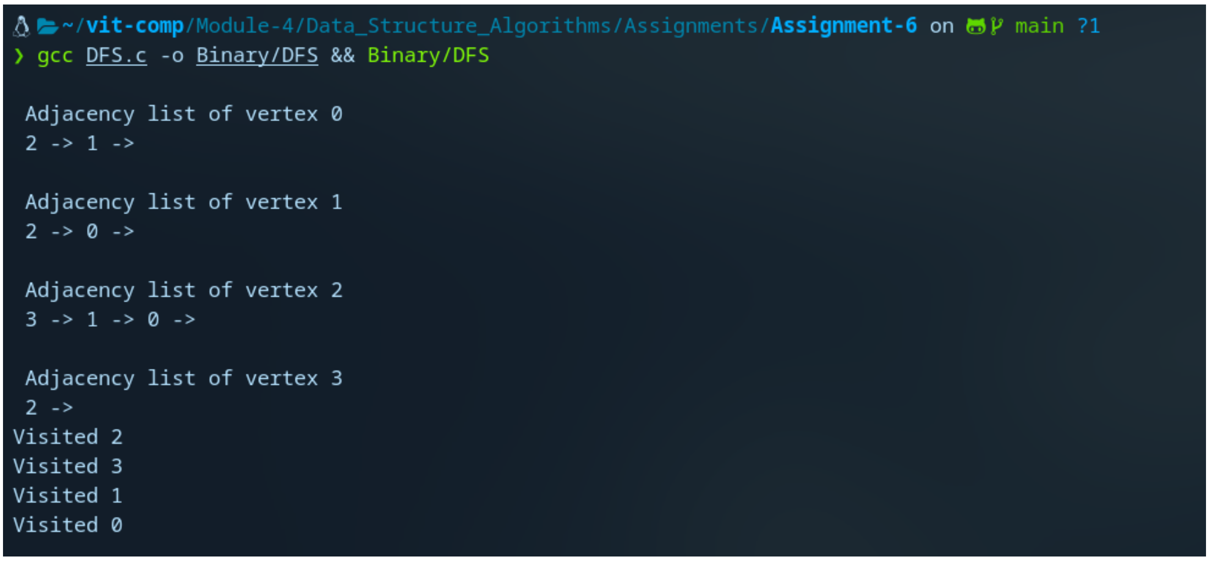
```
graph->adjLists = malloc(vertices * sizeof(struct node*));
graph->visited = malloc(vertices * sizeof(int));
int i;
for (i = 0; i < vertices; i++) {
graph->adjLists[i] = NULL;
graph->visited[i] = 0;
}
return graph;
}
void addEdge(struct Graph* graph, int src, int dest) {
struct node* newNode = newnode(dest);
newNode->next = graph->adjLists[src];
graph->adjLists[src] = newNode;
// Add edge from dest to src
newNode = newnode(src);
newNode->next = graph->adjLists[dest];
graph->adjLists[dest] = newNode;
}
struct queue* createQueue() {
struct queue* q = malloc(sizeof(struct queue));
q->front = -1;
q->rear = -1;
return q;
}
int isEmpty(struct queue* q) {
if (q->rear == -1)
return 1;
```

```
else
return 0;
}
void enqueue(struct queue* q, int value) {
if (q->rear == SIZE - 1)
printf(”¥nQueue is Full!!”);
else {
if (q->front == -1)
q->front = 0;
q->rear++;
q->items[q->rear] = value;
}
}
int dequeue(struct queue* q) {
int item;
if (isEmpty(q)) {
printf(”Queue is empty”);
item = -1;
} else {
item = q->items[q->front];
q->front++;
if (q->front > q->rear) {
printf(”Resetting queue ”);
q->front = q->rear = -1;
}
}
return item;
```



```
}
void printQueue(struct queue* q) {
int i = q->front;
if (isEmpty(q)) {
printf(”Queue is empty”);
} else {
printf(”¥nQueue contains ¥n”);
for (i = q->front; i < q->rear + 1; i++) {
printf(”%d ”, q->items[i]);
}
}
}
int main() {
struct Graph* graph = createGraph(6);
addEdge(graph, 0, 1);
addEdge(graph, 0, 2);
addEdge(graph, 1, 2);
addEdge(graph, 1, 4);
addEdge(graph, 1, 3);
addEdge(graph, 2, 4);
addEdge(graph, 3, 4);
bfs(graph, 0);
return 0;
}
```

OUTPUT



```
~/vit-comp/Module-4/Data_Structure_Algorithms/Assignments/Assignment-6 on main ?1
❯ gcc DFS.c -o Binary/DFS && Binary/DFS

 Adjacency list of vertex 0
 2 -> 1 ->

 Adjacency list of vertex 1
 2 -> 0 ->

 Adjacency list of vertex 2
 3 -> 1 -> 0 ->

 Adjacency list of vertex 3
 2 ->
Visited 2
Visited 3
Visited 1
Visited 0
```