ASSIGNMENT-4
DATA STRUCTURES
(CSU33D05)

SUBMITTED TO:
Dr. Mélanie Bouroche

SUBMITTED BY:
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Declaration concerning plagiarism

I have read and I understand the plagiarism provisions in the General Regulations of the *University Calendar* for the current year, found at http://www.tcd.ie/calendar

I have completed the Online Tutorial in avoiding plagiarism 'Ready, Steady, Write', located at http://tcd−ie.libguides.com/plagiarism/ready−steady−write

STUDENT NUMBER: 21355131

SIGNED:

DATE: 28.11.2021

Task 1:

I have used the .h file given on the blackboard. I created .c file and added the following functions:
- Graph* create_graph(int num_nodes)
- void add_edge(Graph *g, int from, int to)
- void bfs(Graph* g, int origin)
- void dfs(Graph* g, int origin)
- void delete_graph(Graph* g)

Output is as follows:
- on my own editor

```
DFS: A  B  C  D  F  E
BFS  A  B  D  E  C  F
```

- On submitty

Student STDOUT.txt	Expected STDOUT.txt
1 DFS: A B C D F E 2 BFS A B D E C F 3	1 DFS: A B C D F E 2 BFS A B D E C F 3

Student STDOUT.txt	Expected STDOUT.txt
1 DFS: A B D F C E 2 BFS A B D E F C 3	1 DFS: A B D F C E 2 BFS A B D E F C 3

Student STDOUT.txt	Expected STDOUT.txt
1 DFS: A B C D F E G 2 BFS A B D E C F G 3	1 DFS: A B C D F E G 2 BFS A B D E C F G 3

Task 2:

I have used the .h file given on the blackboard. I created .c file and added the following functions:
- Graph* create_graph(int num_nodes)
- void add_edge(Graph *g, int from, int to, in weight)
- void dijkstra(Graph* g, int origin)
- void delete_graph(Graph* g)

Output screenshots:
- on my editor

```
A B C G E D F
The length of the shortest path between A and A is 0
The length of the shortest path between A and B is 1
The length of the shortest path between A and C is 2
The length of the shortest path between A and D is 7
The length of the shortest path between A and E is 5
The length of the shortest path between A and F is 7
The length of the shortest path between A and G is 3
Program ended with exit code: 0
```

- On submitty

Task 3:

In this task dijkstra algorithm is used to find the shortest path between different stops. Here I've used the same code as in task 2 but I've added parsers to import data from edges.csv and vertices.csv using following functions:
- int load_edges (char *fname)
- int load_vertices (char *fname)

After importing the files it then finds the shortest path using dijkstra algorithm and then compares the starting value with StopID in vertices.csv and prints all the details from same csv.

The value of number of edges and vertices are also calculated and printed in the output.

Output for this task is as follows (from submitty)

```
 1  Loaded 4806 vertices
 2  Loaded 6179 edges
 3  Please enter stating bus stop >        Please enter destination bus stop >     300 Eden Quay
 4  497 Amiens Street
 5  515 Amiens Street
 6  516 North Strand Rd
 7  4384 North Strand Rd
 8  519 North Strand Rd
 9  521 Annesley Bridge
10  522 Marino Mart
11  523 Marino Mart
12  669 Malahide Road
13  670 Malahide Road
14  671 Malahide Road
15  672 Malahide Road
16  4382 Malahide Road
17  1185 Collins Ave
18  1186 Collins Ave
19  1187 Collins Ave
20  1188 Collins Ave
21  1189 Collins Ave
22  216 Beaumont Road
23  217 Beaumont Road
24  242 Beaumont Road
25  243 Beaumont Road
26  253 Beaumont Hospital
27
```

```
 1  Loaded 4806 vertices
 2  Loaded 6179 edges
 3  Please enter stating bus stop >        Please enter destination bus stop >     403 Nassau Street
 4  747 Kildare Street
 5  748 Merrion Row
 6  2905 Merrion Sq West
 7  194 Clare Street
 8  195 Westland Row
 9  196 Beresford Place
10  497 Amiens Street
11  515 Amiens Street
12  516 North Strand Rd
13  4384 North Strand Rd
14  519 North Strand Rd
15  521 Annesley Bridge
16  522 Marino Mart
17  523 Marino Mart
18  569 Malahide Road
19  570 Malahide Road
20  571 Malahide Road
21  572 Malahide Road
22  4382 Malahide Road
23  1185 Collins Ave
24  1186 Collins Ave
25  1187 Collins Ave
26  1188 Collins Ave
27  1189 Collins Ave
28  216 Beaumont Road
29  217 Beaumont Road
30  218 Shantalla Road
31  219 Shantalla Road
32  220 Swords Road
33  1622 Swords Road
34  1623 Swords Road
35  1624 Swords Road
36  1625 Swords Road
37  1626 Swords Road
38  1627 Swords Road
39  1628 Swords Road
40  1629 Swords Road
41  1630 Swords Road
42  7348 Dublin Airport
43  3665 Dublin Airport
44
```

```
 1  Loaded 4806 vertices
 2  Loaded 6179 edges
 3  Please enter stating bus stop >          Please enter destination bus stop >     4452 Pearse Street
 4  3235 Pearse Street
 5  3236 Sallynoggin Road
 6  3343 Sallynoggin Road
 7  3248 Sallynoggin Road
 8  7056 Rochestown Ave
 9  4731 Rochestown Ave
10  3249 Pottery Rd
11  7667 Barrhill Rd
12  7652 Killiney Hill Rd
13
```

References:

1. Skeleton code provided
2. Assignment 0
3. GeeksForGeeks
4. Programiz website
5. Slides given on Blackboard