

**CS 211 Data Structures and Algorithms Lab**  
**Autumn 2022**

<b>Assignment no.</b>	6
<b>Objective</b>	To implement BFS and to use it to solve single-source shortest path problem on undirected graphs
<b>Total marks</b>	6
<b>Due date (without penalty)</b>	18th June (Sunday) 11:59 pm
<b>Penalty for late submission</b>	10%
<b>Penalty for violating naming convention(s)</b>	10%

Command-line argument:

Your program should receive a file (input file) as a command line argument.

Input:

Your program should accept an input file as a command-line argument. A typical execution of your program will be ***./a.out input.graph***

- The input file represents an undirected graph.
- The first line of the file contains two numbers:
  - (i) the number of vertices  $n$ ;
  - (ii) the number of edges  $m$ .
- The vertices are numbered from  $0$  to  $n-1$ . Every other line is of the form:  $x \ y$ , which represents an undirected edge between *vertex  $x$  and vertex  $y$* .
- No edge is repeated in the input file.
- The vertex  $0$  is the source (starting) vertex from which you need to find the shortest distances to other vertices.

Your program may create an adjacency list of the input graph.

Task:

Implement BFS and use it to find the shortest distance of every vertex from the source vertex ( $0$ ). The output file should be named as '***sd.txt***'. Every line in the output file should have exactly one integer which represents the distance between the source vertex and the vertex with label  $k-1$ , where  $k$  is the line number. For example, *the first line should have the distance between the source vertex  $0$  and the vertex  $0$  - of course, this value is always  $0$* . The output file must have exactly  $n$  lines. The graph that will be used for evaluation will have at least 1000 vertices and at most 2000 vertices.

Note#1: if there is no path exists from the source vertex 0 to any other given vertex (means if no shortest path exists from the source vertex), then the output file should contain “-1” at that vertex

Note#2: if there is no vertex is presented in the given input file, in that case also the output file should contain value “-1” at that vertex

Submission:

- Submit a valid .c file. [ **.cpp and .txt files as source code are not accepted.**]
- The program you submit should output: **'sd.txt'** when we run the program for evaluation, any other names for the output file are not accepted during auto evaluation, you will be straight away awarded with **0** marks and it is final.
- The main file of your program should be named after your IIT Dharwad roll number. For example, **<roll\_no>.c**, where **roll\_no** specifies your IIT Dharwad roll number (220010001.c)
  - Do the stress test of your program well before submission.
  - You may use the attached sample input files for testing, the corresponding output files are also attached.
  - We have some hidden inputs with us to test your program. The marks you obtain are purely based on whether your program correctly gives outputs for the hidden inputs.
- If your program has only a single source file, please submit the file as it is. If your program has multiple source files, please submit your code as a zip file where the name of the zip file should be your roll number. **It is important that you follow the input/output conventions exactly** (including the naming scheme) as we may be doing an automated evaluation. **There will be a penalty of 10% (on the mark you deserve) if you do not follow the naming conventions exactly.**
- Follow some coding style uniformly. Provide proper comments in your code.
- Submit only through moodle. **Submit well in advance.** Any hiccups in the moodle at the last minute is never acceptable as an excuse for late submission. Submissions through email or any other means will be ignored.
- Acknowledge the people (other than the instructor and TA) who helped you to solve this assignment. The details of the help you received and the names of the people who helped you (including internet sources, if applicable) should come in the beginning of the main file as a comment. **Copying others' programs and allowing others to copy your program are serious offenses and a deserving penalty(100%) will be imposed if found.**
- To be considered for the evaluation without penalty, you have to submit your program by the due date. **No single minute relaxation on late submission.**

- **Submissions after 24 hours of the due date will not be accepted.**