2022_DS_Fall_Homework 1

Notice

The deadline is 2022/10/20 23:59. Homework should be submitted as a c source file, not an executable file. In your homework, read input from `stdin` and write your output to `stdout`. The file name would like `F12345678_hw1_p1.c`.

Execution environment and Constraint.

- CPU core: 1
- Memory: 2 GB
- Execution time limit: 1 second
- C Compiler: GCC
  - compiled with `-O3 -std=c11 -Wall`
- C Standard: C11
- Use header file only from C Standard Library
- OS: Linux 22.04.1 LTS

Problem 1 : Prefix, Infix and Postfix (2%)

Write two C functions. The first one transforms an infix expression into a postfix one, and second one transforms a postfix expression into a prefix one.

The function should be store in different file like `F12345678_hw1_p1-1.c` and `F12345678_hw1_p1-2.c`.

Problem 2 : Heap (2%)

Write a program that allows the user perform the following operations on min heap.

1. `insert x` : Add a new node, which value is x into the min heap.
2. `remove` : Remove the key with the lowest value, and print the value and breakline. If the heap is empty, print empty.
3. `change x,y` : Change the value in the node x to y. If x is out of range, print `out of range`.(x : index, y : value)

(Note: The index in the heap starts at 0.)

operations: insert, remove and change.

You are given some input and ouput files. Following the operations in the input file.

The instuctions are insert, remove, change and quit. Instruction quit means you should terminate your program.

Problem 3 : Graphs (3%)

Write a C function that finds a minimum cost spanning tree using Kruskal's algorithm.

You are given a input file. The first line shows V and E. V represents the vertice number while E is the edge number. The rest shows the edge detail. Each line contains s, t and c, which means there is an edge between s and v with cost c.

Constraints

- $1 < V \leq 10^6$
- $V - 1 \leq E \leq min(\frac{V(V-1)}{2}, 2 \times 10^6)$
- $1 < c,\ s,\ t < 10^6$