

Programming assignment #3

Cargo Transportation

Objective

1. To understand how to design an algorithm.
2. To exercise the concept of flow networks.
3. To learn how to analyze an algorithm.

Problem

You are the employee of logistic enterprises. There are several warehouses in your company, and some cooperation stores. Your job is transporting cargo from one factory to the cooperation stores. Trucks to and from warehouses and stores have load restrictions. Please find out the maximum quantity you can ship from the factory. Note the following constraints :

1. There will be trucks to and from the warehouses, and trucks to and from the stores.
2. **Only** the trucks to and from warehouses and factory have **NO** load restrictions.
3. There will only be **ONE** truck in the same direction between A and B.

Compile & Execute

Compile command : `$ g++ <hw3.cpp> -O3`

Execute command : `$./<execute file> <input file> <output file>`

(Ex : `$./a.out input1.txt output1.txt`)

Note that input and output file should be the arguments of program. Please make sure your code can be compiled and executed.

Input

Input file is a node list of following format :

Total number of warehouses and stores

List of warehouse shipped directly from the factory

List of stores

The capacity of warehouses and stores

Number of trucks

List of trucks

<truck starting point> <truck ending point> <load restriction>

...

The warehouses and stores have index start from 1, while 0 representing the factory. There are trucks from factory to the warehouses whose index are list on the line 3 in input file with no load restrictions. The capacity of warehouses and stores preset to unlimited (except in bonus cases).

Input example

```
4

1  2
4

Inf Inf Inf Inf

6
1  2  6
1  3  9
2  3  8
1  4 13
2  4  7
3  4 17
```

Output

```
37      // maximum quantity shipped from the factory
```

Program Submission

1. Please use the C++ language and your program **must be written in only one source file**.
2. Your source file must be named as “**Student_ID_number_hw3.cpp**” and please make sure that all characters of the filename are in lower case. For example, if your student number is 9711592, the name of your program file should be “**9711592_hw3.cpp**”.
3. Upload your report and program to the E3 by deadline.
4. Don't print any words on the terminal.

Report

1. No more than 3 pages. (including bonus)
2. Your report must contain:
 - a. The flow chart or the pseudo code of your program. (Do **NOT** use handwriting picture or screenshot of entire program.)
 - b. The design concept of your algorithm.
 - c. Discussion or problems in implement time.

3. The report file name must be “**Student_ID_number_hw3.doc(x)**” or “**Student_ID_number_hw3.pdf**” and please make sure that all characters of the filename are in lower case. For example, if your student number is 9711592, the name of your program file should be “**9711592_hw3.pdf**”.

Bonus

On a practical level, there is also capacity limit for warehouses. In the bonus cases, there will be capacity constraint for warehouses. That is, the value in line 6 in input file may not be “Inf”. The rest is the same, please also find out the maximum quantity that can be shipped.

4	// bonus input	
1	2	
4		
40 30 20 30		
6		
1	2	6
1	3	9
2	3	8
1	4	13
2	4	7
3	4	17

30	// bonus output
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Grading

- **Report** **30%**
- **Case 1** **15%**
- **Case 2** **15%**
- **Hidden cases** **30%**
- **Bonus** **10%**

* Time limit for each case is 300s.

Noting

- **Due Date : 2020/1/12 23:55:00**
- **You'll get 0 points if not hand in on time.**
- **Plagiarism is forbidden.**