

COE 444 - Internetwork Design and Management
Spring 2003 (Term 022)

Programming Assignment # 1
Wednesday April 23rd, 2003

Due Date: Wednesday May 21st, 2003

Q.1. Write a program that implements Kruskal's algorithm or Prim's algorithm. The program has to construct a minimum cost feasible spanning tree connecting n switches to the main backbone switch (Node number 1). The flows from the various switches to the backbone, and the cost of connecting nodes to each other are given as the input to the program. Assume that there is a design constraint to have the flow on any link not to exceed `max_flow` Mbps.

The input of your program is a file called "input.txt" including the number of nodes n in the first line, the *max_flow* in the second line, the flows from each node in the third line, and the link cost matrix in the subsequent lines ("-" means there is no link). There is a "tab" between every two elements in the same row.

The following is an example of input.txt contents:

```
5
5
- 2 3 2 1
- 3 3 5 10
3 - 6 4 8
3 6 - 3 5
5 4 3 - 7
10 8 5 7 -
```

The output of your program is a file called "output.txt" that includes the links included in the tree represented by initial node and final node, and the cost of this link. The last line in the file includes the overall cost of the tree. A "tab" must be included between every two elements in the same row.

The following is the output.txt generated for the above output.txt:

```
1 2 3
1 3 3
2 5 8
3 4 3
17
```

Producing the constrained minimum spanning tree (CMST) in a graphical form is a plus and will be given a bonus.

Send the **source code** (including thorough comments) and the **executable program** by email to: sgalli@ccse.kfupm.edu.sa by the due date. Also, include a **Readme** file on how to run the program and the expected input. Compress all the files to be submitted in a file named **coe444-prog1-<kruskal/prim>-<yourID>.zip** that you send by email. The subject in the email should be “**coe444-prog1-<kruskal/prim>**”.

Q.2. Test the correctness of your program by generating the output for the input files provided by the instructor.

Include in your email a copy of the output files generated by your program for each input file (include them in the above zip file as well).

Late Submission:

The due date for submission is **Wednesday, May 21st, 2003 at 11:59pm**. Programs submitted after the due date will have 10% of the assignment maximum grade subtracted for every late day. If the submission is one week late, the grade for the assignment will be 0. (e.g. If you get a grade of 80% in the assignment and it was submitted 2 days later than the due date, you'll only receive a grade of 60%).