Data Structures: 505 22240 / ESOE 2012

Homework Assignment 3: Tree Traversals and Priority Queues

Due: the week after next in class, 11:10am

Total score: 100

1. What is the **output** from the following sequence of priority queue ADT methods? insert(5, A), insert(4, B), insert(7, I), insert(1, D), removeMin(), insert(3, J), insert(6, L), removeMin(), removeMin(), insert(8, G), removeMin(), insert(2, H), removeMin(), removeMin()? Show me the removed and final contents in the priority queue after the above operations. (15%)

2. Show that the sum $\sum_{i=1}^{n} \log i$,
which appears in the analysis of heap-sort, is $\Omega(n \log n)$. (10%)

3. Show how to implement the standard queue ADT using only a priority queue and one additional integer instance variable. (20%) [*hint*: describe how to implement enqueue() and dequeue() functions.]

4. Draw an arithmetic expression tree that has *four* external nodes, storing the numbers 1, 5, 6, and 7 (with each number stored in a distinct external node, but not necessarily in this order), and has *three* internal nodes, each storing an operator from the set {+, -, ×, /}, so that the value of the root is 21. The operators may return and act on fractions, and an operator may be used more than once. (20%)

5. Textbook exercise: Chapter 15, Prob. 4 on pg. 474. (15%)

6. Draw a single binary tree *T* such that (20%)
   - Each internal node of *T* stores a single character.
   - A preorder traversal of *T* yields EXAMFUN.
   - An inorder traversal of *T* yields MAFXUEN.