

### Masters Exam, Algorithms: Spring 2001

Answer all problems; the first problem is the most important.

1. Let  $P_1, P_2, \dots, P_n$  be  $n$  programs to be stored on a single disk. Program  $P_i$  requires  $s_i$  kilobytes of storage, and the capacity of the disk is  $D$  kilobytes, where  $D < \sum_{i=1}^n s_i$ . We want to maximize the number of programs held on the disk; give an optimal greedy algorithm to do this, and prove that the algorithm is correct.

Now, suppose we want to maximize the amount of space used on the disk (maximize  $\sum_{i=1}^n s_i$ ). Can we do this? Why, or why not?

2. Give a definition and draw a graph to illustrate each of the following.

- $O(f(n))$
- $\Theta(f(n))$
- $\Omega(f(n))$

3. Sketch code for minimum spanning tree (either Prim's or Dijkstra's).

4. For the tree shown, give the order of vertices visited in infix, prefix, and postfix order.

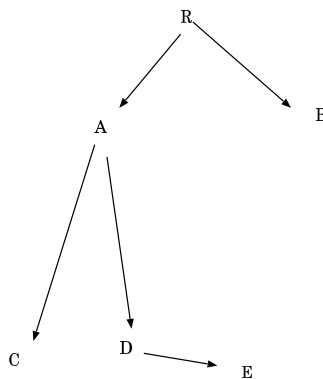


Figure 1: A tree (assume that the root is vertex R).