

**COT 54005: Advanced Algorithms
Fall 2006**

Assignment 2

1. (10 points) Show all steps involved in finding the 4th smallest number from the following list of numbers, using the randomized selection algorithm discussed in class:
15 14 13 12 16 10 17 11. Use the following random sequence, with elements in (0,1):
0.9 0.1 0.5 0.8 0.7.
2. (10 points) Construct a finite automaton for the pattern: *00101* and illustrate its operation on the text string *1100010100100101001*.
3. (10 points) Construct a layered range tree for the following set of points: $\{(2,8), (8,4), (7, 7), (3,2), (4,10), (5,5), (6,6)\}$, using the procedure discussed in class. Show the steps involved in searching for all points in the following range: $[2.8,6] \times [4,9]$.
4. (10 points) Let A be a three-dimensional $n \times n \times n$ array stored in row major order, as in C/C++. Give two algorithms that print all the elements of A , one of them having cache complexity $O(n^3)$ and another $O(n^3/L)$, under the ideal cache model.
5. (10 points) Problem 32.4-5 from *CLR*. Give a linear time algorithm to determine if a text T is a cyclic rotation of another string T' . For example, *arc* and *car* are cyclic rotations of each other.