CS 5800: Algorithms	V. Pavlu, K.Lieberherr
	Due: March. 17, 2014

Homework Module 8

1 Submission Rules

`http://www.ccs.neu.edu/home/lieber/courses/algorithms/cs5800/sp14/homeworks/submission-rules.pdf`

2 Problems

1. (30 pts) Write a two page summary of all concepts and techniques in CLRS Chapter 10 (Elementary Datastructures).

2. (30 pts) Write a two page summary of all concepts and techniques in CLRS Chapter 12 (Binary Search Trees).

   The next 3 problems ask for pseudo code.

3. (10 pts) Exercise 10.1-6. (Simulate queue with two stacks)

4. (10 pts) Exercise 10.1-7. (Simulate stack with two queues)

5. (10 pts) Exercise 10.2-2. (Simulate stack with singly linked list)

6. (10 pts) Exercise 10.2-6. (UNION)

7. (10 points)

   Debate the following claim and turn in your winning strategy.

   Claim PascalTriangleAsymptotics: For all k in Nat Exists c in Nat binomial(n,k) is $\Theta(n^c)$.

   This is in reaction to the midterm where some wrote binomial(n,3)=$\Theta(2^n)$ or $\Theta(n!)$.

8. (10 points)

   Consider the following from the earlier HSR homework:

   http://www.ccs.neu.edu/home/lieber/courses/algorithms/cs5800/sp14/labs/HSR-problem-CS5800-1.pdf

   HSR(n,k,q)= Exists T:DecisionTree(n,k,q) ForAll m in [0..n-1]: T correctly finds m (the highest safe rung) with at most q decisions. DecisionTree(n,k,q): A decision tree for HSR(n,k,q) must satisfy the following properties: 1) there are at most k yes from the root to any leaf. 2) the longest root-leaf path has q edges. 3) each rung 1..n-1

appears exactly once as internal node of the tree. 4) each rung 0..n-1 appears exactly once as a leaf.

Your task is to add a 5th property to the above 4 properties of DecisionTree(n,k,q) calling the new concept DecisionTree2(n,k,q) so that

HSR2(n,k,q)= Exists T:DecisionTree2(n,k,q): T correctly finds the highest safe rung with at most q decisions.

Debate the following claim and turn in your proof: ForAll n,k,q in Nat: HSR(n,k,q) if and only if HSR2(n,k,q).