Final Exam

Data Structures, August 31, 2012

Moed Bet

N. Danzig, Instructor

2.5 hours

Closed book

25 points. (Answer 5 out of 6 questions. If you answer all 6, I will ignore the last question.)

------------------------------

1. What is a sentinel value? How does it assist in creating a bounded array?

2. What is the worst case scenario for searching binary search tree? Explain.

3. What is a balanced tree? In what situations would it be advantageous versus a regular BST? What are its implementation drawbacks?

4. When do 2-3-4 trees increase their number of rows?

5. What is the inherent difficulty in implementing a Fifo Array versus a Lifo Array?

6. What is the rule of least access (least privilege)?

25 points each. (Answer 3 out of 4. If you answer all 4,

I will ignore the last question.)

1. Use an array of 10 nodes to implement a fifo. It should not be necessary to use pointers or pointer arithmetic. Write only the class definition for node and fifo.

Write the push and pop functions for your fifo. If you try to push an

eleventh element push should fail and throw an exception. If you pop

from an empty list pop should fail and throw an exception. Obviously,

if you push 10 nodes and then pop some off, you should still be able

to push more nodes.

1. Write a function to print a descending ordered array form Heap. Print it

greatest to smallest. It should be an integer heap. Assume that the functions push and pop already exist. Assume the limit of the size of the heap to be 10,000 elements. When your function completes (returns), the heap should be as it was before the function call. The function should not corrupt the heap in any way.

3. Write the delete\_node function for a sorted linked-list (sorted in ascending order). Be sure to correctly assign the next pointer. Also write the class definition (without the function definitions) for class node and a class linked-list.

4. Write a function to implement a "quicksort" on an array of integers.

-------------------------------------------------

Bonus question (5 points): Explain how using inheritance and virtual functions

one can create a single link-list of objects of differing types (differing classes).