1 Exam Policy

- Thursday, 03/23/17, 10:15am - 12:15 am. Total length: 2 hrs, start promptly at 10:15am. Please be on time.

- Format: Total Score 60 (final takes 30% of your total score). 11 problems in total: 4 problems with 4 points each, 4 problems with 5 points each, 1 problem with 6 points, 10 True/False questions (10 points in total), and 1 analysis problem (8 points).

- Note: Two pages of handwritten\(^1\) or typed (with font size at least 10) notes (8.5 by 11 inches, front and back) allowed.

- The solution of the final will be posted by 03/23/17. You should expect your final-exam grades on Canvas by 03/26/17.

2 General Comments

Do your best to get as many points as you can: answer the questions you know first, and briefly show your thinking or write down a partial answer even when you’re not completely sure.

Most of the questions will be of the form "prove X" or "show Y," with some guidance as to what methods you should use and how formal you should be. A few questions could be creative or qualitative, e.g., "Describe how to modify data structure X in order to efficiently implement operation Y" or "Which data structure would be most appropriate for problem Z?"

3 What to Study

- Solutions to assignment 1, 2, 3, 4, 5, mid-term.
- Slides and lecture notes posted online.
- Textbook Chapter 1, 2, 3, 6, 7, 8, 9, 10, 12, 13, 14, 17
- Your own notes from the lecture.
- Discussions on piazza. Ask questions and make good use of office hours.

4 Topics & Sample Problems

The scope of the final exam is from Week 1 to the first lecture (03/13/17) in Week 10.

\(^1\)If extensive handwriting is a problem for you, please let me know as soon as possible and accommodations can be made.
**Topics before mid-term**

- Big-O, big-Omega, and big-Theta. For each of these, you should know the formal definition and be able to use it to prove or disprove statements.
- Loop invariants.
- Stacks, queues: Basic definitions and common usage.
- Amortized analysis: accounting and potential method. You will be free to use either method in your answer, but make sure you are comfortable with at least one.
- Trees: binary trees, non-binary trees, array-based implementation of binary trees. Questions may involve traversals, insert/delete, and recursive and iterative algorithms, properties about trees.
- Binary Search Tree: definition and properties of binary search trees, insertion and deletion operations.

**Topics after mid-term**

- Heap and priority queue: insertion and removal operations, how to make use of heap in algorithms.
- Red-black tree: definitions, insertion and delete operations of red-black trees.
- Augmenting Data Structures: basic principles to augment data structures, ability to design augment data structures for special purposes.
- Comparison-based and non-comparison-based sorting algorithms, the decision tree method: implementation and complexity of various sorting algorithms, using the decision tree method to prove simple lower bounds.

**Attention:** we have mentioned a few alternatives for the implementation of operations of data structures during the term. For exam purpose, please stick to the implementation in the slides and the textbook.