

# CS124 Exam 1 Study Guidelines

## How to study:

- Review the materials based on the lecture slides.
- Review the homework.
- Do not need to review *formal* proofs.

## What to study:

### Chapter 1 (Introduction):

- Recursion and induction: concept, inductive proof of recursion.

### Chapter 2 (Algorithm Analysis):

- Definition running time complexity -- big-Oh ( $O$ ), big-omega ( $\Omega$ ), theta ( $\Theta$ ) – and their comparison.
- Given a function, derive its asymptotic function.
- Big-Oh rules
- Run-time analysis of an algorithm (non-recursive or recursive).

### Chapter 3 (Lists, Stacks, and Queues):

- Multi-list: array vs. multi-list representation of a 2-dimensional matrix. Comparison of run-time and storage space between them.
- Evaluating a postfix, infix, prefix arithmetic expression.

### Chapter 4 (Trees):

- Definition of a tree. Taxonomy of trees.
- Representing an M-ary ( $M > 2$ ) tree as a binary tree.
- Binary tree traversal: preorder, inorder, and postorder -- concept and example.
- Binary search tree, AVL tree, splay tree, B tree:
  - For each tree structure, the property, running examples of inserting or finding a node for a given input key sequence, and running time complexity (no formal proof but an informal argument as presented in the lecture slides).
  - Concepts: (example questions below; note these are just examples)
    - Why is it important to balance a binary search tree?
    - What is the difference in the balancing approaches used by an AVL tree and a splay tree?
    - What is the splay operation and what is the rationale for such splaying?
    - How does a B-tree achieve “perfect” balancing?
    - What does a node represent in a disk-resident B tree?