CS124 Midterm Exam (1): Study Guidelines

How to study:
- Review the materials based on the lecture slides, and read the textbook to enhance your understanding.
- Make sure that you can do all Assignment-1 questions now.

What to study:
Chapter 1 (Introduction):
- Concepts of abstract data types, data structures, and algorithms, and relationships among them with respect to the performance of a program.
- Recursion and induction. Proof of the correctness of a recursive function using the induction technique.

Chapter 2 (Algorithm Analysis):
- Definition of running time complexity -- big-Oh (O), big-omega (Ω), theta (Θ) – and their comparison.
- Given a function, derive its asymptotic function. $3 + 8N+5N^2 = O(N^2) < O(N^3) < O(N^4)$.
- Big-Oh rules
- Run-time analysis of an algorithm (non-recursive or recursive), involving (a) building and (b) solving a recurrence relation.

Chapter 3 (Lists, Stacks, and Queues):
- Concepts of FIFO, LIFO, DE and priority queues
- Design different data structures (such as multi-lists and 2-D arrays) for high-dimensional arrays, and compare and contrast these data structures.

Chapter 4 (Trees, Sections 4.1 ~ 4.3 only):
- 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 -- concepts and examples.
- Binary search tree:
  - BST property, running examples of inserting or finding nodes for a given input key sequence, and running time complexity of these operations (no formal proof but an informal argument as presented in the lecture slides).