**数据结构考试复习提纲(2021fall)**

考试题型

选择题 10题 20%，填空题 10空 20%，综合题（4题40%），设计题（1题 20%）

Chapter 1 Programming: A General Overview

**理解** concept of Data Structure and algorithm, ADT

Abstract Data Type (ADT) - A data object and a set of operations for manipulating it.

Mathematical description of an object with set of operations on the object. Useful building block.

Data structure- A specific family of algorithms for implementing an abstract data type.

Implementation of data structure - A specific implementation in a specific language.

Algorithm - A high level, language independent, description of a step-by-step process.

**了解** math preliminaries

**掌握** math computations, such as exponents, logarithms, series, etc. Recursion

Chapter 2 Algorithm Analysis

**理解：**growth rate, typical growth rate equation(n!, 2n, nlogn, n2,n, etc.); upper & lower bounds and relative rules; Best, worst and Average cases

c1 logn<c2n<c3nlogn<c4n 2 <c52n<c6n!

The growth rate is the rate at which the cost of the algorithm grows as the input size grows.

The idea of the definitions is to establish a relative order among functions.

• Measures the efficiency of an algorithm, as the input size becomes large – growth rate.

• best-case often of little interest.

• average-case often reflects typical behavior.

• worst-case represents a guarantee for performance on any possible input.

规则：第二章14页

U/L bounds can be used to describe the running time of an algorithm in its [best, worst, average] case.

**掌握：**Asymptotic analysis

Chapter 3 Lists, stacks and Queues

**掌握:** Lists, stacks and Queues (logical and storage structures, implementations, and algorithm complexity), break-even point

Chapter 4 Trees

**理解** definition and properties of tree, Binary tree, complete binary trees, full binary trees, Balance trees, 2-3 trees, B-trees

**了解** Amortized Analysis

**掌握**Binary tree: Binary tree Traversals (preorder, postorder, inorder), implementations and their space requirements; BST(construction, search, insert, delete, and algorithm complexity); AVL Trees(AVL property, re-balancing operations); Splay Trees(Splay property, splaying operations); Implementations of all above trees.

Chapter 5 Hashing

Hashing: The process of mapping a key value to a position in a table.

**理解:** Concepts of searching

**掌握:** Binary search, Hash table, hash function, collision and collision resolution policy(separate chaining and open-addressing), probe function (linear probing, pseudo random probing, quadratic probing, double hashing)

Chapter 6 Priority Queues (Heaps)

**理解:** Concepts of priority queues, Complete binary tree 第7页

Complete: the tree is completely filled except possibly the bottom level, which is filled from left to right

**掌握:** Binary heaps(insertion, delete and buildHeap operations and their algorithm complexity)

Chapter 7 Sorting

**理解** internal sorting and external sorting, a general Lower Bound for Sorting（Part 2. P3）

**掌握** All sort algorithms learned (Ideas, properties, processes, implementations and their complexity)

Chapter 8 The Disjoint Sets Class

**理解** Equivalence class and the dynamic equivalence problem

**掌握** union/find algorithm(Smart union algorithms-union by-size & union by-height, path compression)

Chapter 9 Graph Algorithms

**理解** concept of graph,

A graph is simply a collection of nodes plus edges.

**掌握** two representations of graph, BFS and DFS, Topological sort, Dijkstra‘s algorithm, Prim and Kruskal algorithm. shortest-path, Minimum-cost spanning trees, connected components problems

(ideas, processes, implementations)

最小堆删除最小节点时用最后一个节点代替根节点

二叉查找树删除节点时用右子树的最小节点

生成树删除节点时将其伸展至根节点，再用左子树的最大节点