

Final RC Part1

Final Exam Layout

12 multiple choices questions, with 8 single answer questions (3 points each), and 4 multiple answers questions (4 points each).

4 questions (15 points each). 1 question about midterm, 1 question about K-D Tree, 1 question about Graph, 1 question about Dynamic Programming.

Review of Midterm

Don't worry. There are only quick questions about the content before midterm.

- **Master Theorem**

$$T(n) \leq aT\left(\frac{n}{b}\right) + O(n^d)$$

$$\text{if } a = b^d, T(n) = O(n^d \log n)$$

$$\text{if } a < b^d, T(n) = O(n^d)$$

$$\text{if } a > b^d, T(n) = O(n^{\log_b a})$$

- **Properties of Comparison Sorting Algorithms**

	Worst Case Time	Average Case Time	In Place	Stable
Insertion	$O(N^2)$	$O(N^2)$	Yes	Yes
Selection	$O(N^2)$	$O(N^2)$	Yes	No
Bubble	$O(N^2)$	$O(N^2)$	Yes	Yes
Merge Sort	$O(N \log N)$	$O(N \log N)$	No	Yes
Quick Sort	$O(N^2)$	$O(N \log N)$	Weakly	No

- **Selection**

What is selection? Find i-th smallest element in an array.

How to do selection quicker than sorting? Randomized selection. (no need to master deterministic selection)

- **Hashing Basics**

Two ways of collision resolutions and details:

Separate Chaining, Open Addressing.

Different types of open addressing:

Linear Probing, Quadratic Probing, Double Probing.

- **Tree Basics**

Terminologies of trees: depth, level, height, degree

Types of binary trees: proper, complete, perfect

- **Tree Traversal**

depth-first: in-order, pre-order, post-order

breadth-first: use queue or stack

- **Fibonacci Heap**

covered in other slides :)

- **Binary Search Tree Basics**

height of balanced BST: $O(\log n)$

details of searching, insertion, and deletion operations