

Final Exam Coverage/Review

FALL 2003

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Math Topics, Time and Space Complexity

- Sets/Relations, Summations, Logarithms
- Time Complexity
 - Asymptotic assessment
 - Data structure operations
 - Algorithms
- Space Complexity
 - Space overhead to represent structure
 - Tradeoffs across structures/implementations
- Best-case, worst-case, average-case analysis

Linear and Tree Structures

- Array and linked implementations of lists
- Binary search trees and heaps particularly when used in later topics (sorting, indexing, etc.)
- Other topics:
 - Huffman coding trees
 - Traversals (preorder, post order, in-order)
 - Sequential representation for binary trees and general trees

Sorting

- $O(n^2)$ algorithms: insertion, bubble, selection
- $O(n \log n)$ algorithms: quick, merge, heap
- Lower bound analysis for comp-based sorting
- $O(n)$ algorithms: bucket/bin, radix

- Question types: step-by-step simulation, comparison between algorithms, pros/cons

File Processing and External Sorting

- Computing Disk Read Time
 - Given disk, track, sector, cluster info compute the time it takes to read data from a file
- Buffer Pools
 - Implementation issues (see ADT)
 - Replacement policies (FIFO, LRU, LFU)
- External Sorting
 - External merge sort, replacement selection, multi-way merge

Hashing

- Open hashing: slots are bins for lists
- Closed hashing: table contains records
- Bucket hashing: bucket size and overflow space

- Question types: determine home position, probe sequence, or landing slot; effect of changing hash function, probe function, and other parameters

Indexing

- 2-3 Trees
- B-Trees
- B+ Trees

- Question types: simulation of operations, differences, pros/cons

Graphs

- Notation and definitions: graph, directed graph, vertices, edges, paths, cycles
- Graph representation
 - Adjacency matrix, Adjacency list
- Graph Traversals
 - DFS and BFS
- Graph Algorithms:
 - TopSort, Shortest Paths (Dijkstra), MCST (Prim, Kruskal)
 - *Floyd NOT COVERED IN EXAM