Topics for Written Exposition: Analyze some of these in great detail, writing them up so that others can really understand in depth.

4.1 (Insertion Sort)

4.2 Topological Sorting: Demonstrate the algorithms on more extensive examples

4.3 Johnson-Trotter Algorithm for generating permutations: Explain and demonstrate with a bigger example why the algorithm works

4.4 (Russian Peasant Multiplication)

4.4 Josephus Problem: Thoroughly explain how the 1-bit cyclic shift solves the problem

4.5 Lomuto Partitioning with Quickselect: Explain how it works and demonstrate Quickselect

4.5 Game of Nim: Discuss solutions to variants of Nim, Explain convincingly how the binary sum technique works

5.1 (Mergesort)

5.2 Quicksort: Compare to Quicksort in detail – when would each be used?

5.4 Multiplication of large numbers: Thoroughly explain the time complexity

5.4 Strassen's Matrix Multiplication: Thoroughly explain the time complexity

5.5 Closest-Pair Problem: Thoroughly present the algorithm and explain the time complexity in detail

5.5 Quickhull for Convex-Hull Problem: Demonstrate the algorithm on a complete example and show precisely how the points can be determined to be on the right or left of the line segment

6.2 (Gaussian Elimination)

6.2 LU Decomposition: Explain in detail how LU Decomposition works

6.3 AVL Trees: Discuss how it works and demonstrate the algorithm on more extensive examples

6.3 2-3 Trees: Discuss how it works and demonstrate the algorithm on more extensive examples

6.4 Heaps with Heapsort: Present in detail the time complexity analysis of the main methods of working with heaps

6.5 Horner's Rule to evaluate polynomials: Present Synthetic Division in detail with examples

6.5 (Binary exponentiation Left-Right and Right-Left)

7.1 (Comparison Counting Sort)

7.1 (Distribution Counting Sort)

7.2 (Horspool's Algorithm for string searching)

7.2 Boyer-Moore Algorithm for string searching: Thoroughly compare/contrast and demonstrate Horspool’s and Boyer-Moore

7.3 (Hashing closed and open)

7.4 B-Trees: Demonstrate the algorithm with a more complete example

8.1 (Basic Dynamic Programming examples)

8.2 (Knapsack Problem with Memory Functions (memoization))

8.3 Optimal Binary Search Tree construction: Explain in detail and a good example how this works

8.4 Warshal's Algorithm for transistive closure of directed graph: Demonstrate in detail how this works

8.4 Floyd's Algorithm for All-Pairs Shortest-Paths Problem: Demonstrate in detail how this works

9.1 Prim's Algorithm for minimum spanning tree: Demonstrate in detail how this works

9.2 Kruskal's Algorithm for minimum spanning tree: Demonstrate in detail how this works

9.2 Disjoint Subsets and Union-Find Algorithms: Demonstrate in detail how this works

9.3 Dijkstra's Algorithm for single-source shortest-paths problem: Demonstrate in detail how this works

9.4 Huffman's Algorithm for a Huffman Code: Demonstrate in detail how this works

10.1 Simplex Method for solving systems of linear inequalities: Demonstrate in detail how this works

10.2 Ford-Fulkerson method for maximum-flow problem: Demonstrate in detail how this works

10.3 Maximum matching in bipartite graphs: Demonstrate in detail how this works

10.4 Stable Marriage Problem: Demonstrate in detail how this works

12.1 n-Queens Problem with Backtracking

12.1 Hamiltonian Circuit and Subset-Sum Problems with Backtracking

12.2 Assignment Problem with Branch-and-Bound

12.2 Knapsack Problem with Branch-and-Bound

12.2 Traveling Salesman Problem with Branch-and-Bound

12.3 Traveling Salesman Problem - Approximation Algorithms

12.3 Knapsack Problem - Approximation Algorithms