CSUS
COLLEGE OF ENGINEERING AND COMPUTER SCIENCE
Department of Computer Science

CSc 130
Ouyang

DATA STRUCTURES AND ALGORITHM ANALYSIS
The Final Exam Study Guide

1. Binary Heap
   a. Binary heap structure property and heap order property.
   b. Write **the pseudo code** for the "insert", "deleteMin/deleteMax", and "buildHeap" operations.
   c. Manipulate a heap in the array step by step according to the algorithms of "insert", "deleteMin/deleteMax", and "buildHeap".

2. Know how the major sorting algorithms work, e.g., heapsort, mergesort, and quicksort.
   a. Heapsort
      i. **Pseudo code**.
      ii. Use heapsort algorithm to manipulate a heap in the array step by step till the array is sorted.
   b. Mergesort
      i. **Pseudo code**.
      ii. Show how to merge two pre-sorted arrays into one single array.
   c. Quicksort
      i. **Pseudo code**.
      ii. Show how to partition the array step by step into S_1, pivot, S_2.

3. Understand the definitions associated with graphs.
   a. Connected undirected graph; loop and cycle; DAG; simple path; strongly connected graph; weakly connected graph; complete graph

4. Understand the representation of graphs.
   a. How to store a graph using the adjacency list data structure.

5. Graph algorithm.
   a. Construct a minimum spanning tree, using the Prim algorithm. Fill/update the (Known, d_v, p_v) table step by step.
   b. Find the single-source shortest paths for a vertex in a given graph. According to Dijkstra's algorithm, fill/ update the (know, dv, pv) table step by step, then draw the shortest paths according to the final table.

6. Divide and Conquer technique and its application, e.g. MergeSort, Quicksort, etc.

7. Understand how hashing works.

   a. Define the following terms: collision, separate chaining, linear probing, quadratic probing, double hashing, rehashing.

   b. Assume that we are using the hashing function hash(key)=key mod 11 and the following sequence of keys create a hash table: 26, 16, 14, 86, 98, 12, 10, 74. (1) Use linear probing i; (2) Use quadratic probing i2; (3) Use double hashing by a second hash function; (4) Use separate chaining.