CSE 5311 Name _____
Summer 1999
Test 1
Closed Book Questions - 5 Points Each

1. What is the value *m* that was used in the linear-time worst-case selection algorithm?
2. When does the zig case occur for splaying?
3. What is the count technique for self-adjusting lists?
4. What is the maximum number of previously stored keys that may be moved during an insertion by Brent's method?
5. What is the smallest number of vertices in an AVL tree with depth 4? (Note: the root is at depth 0).
6. What is the smallest number of vertices in a red-black tree with depth 4? (Note: the root is at depth 0 and is colored black).
7. Give Prim's algorithm.
8. What will indicate the need for a rotation during AVL tree key insertion?
9. What is optimized in an optimal binary search tree?
10. How is the number of pointers in a node in a skip list determined?

CSE 5311 Name _____
Summer 1999
Test 1
Open Book Questions

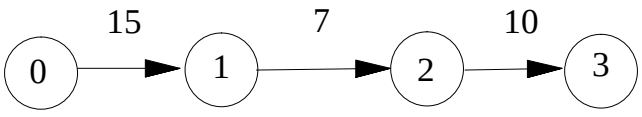
1. Suppose that you are given n values. Give a linear-time algorithm to build a binomial heap with the n values. 15 points.
2. Give an algorithm, based on Kruskal's algorithm, to determine if a graph has more than one minimum spanning tree. 15 points
3. Evaluate the recurrence $T(n) = T(n/2) + n$ using the master method. 5 points
4. In the first programming assignment, you were to determine the potential of a splay tree. Most likely you used a recursive, linear-time approach for this. Explain how the tree could be modified to support recomputing the potential while splaying after an access. Note that you are given the potential of the tree *before* splaying starts. 15 points

CSE 5311 Name _____
Summer 1999
Test 2
Closed Book Questions - problems 1- 6 are 5 points each

1. What property is guaranteed in a solution to the stable marriages problem?
2. What is the complexity of Strassen's matrix multiplication algorithm?
3. What is the best known lower bound on the time to multiply two n x n matrices?
4. What is an augmenting path?
5. What is the complexity of the Jarvis march technique?
6. When does an instance of the stable marriage problem have a unique solution?
7. Describe the Rabin-Karp algorithm. 10 points
8. What is the subset sum problem? How much time does its dynamic programming solution take? 10 points

CSE 5311 Name _____
Summer 1999
Test 2
Open Book Questions

1. In the **even-subset-sum problem**, all input values (including the desired target value) are even natural numbers. Give a reduction from the **subset-sum problem** to show that **even-subset-sum** is NP-complete. 15 points
2. Show the lift and push operations for performing preflow-push on the following network. 0 is the source and 3 is the sink. 15 points



3. Give the male-optimal solution for the following instance of the stable marriage problem. 10 points

```
male preference lists are:

1:  1  2  3  4  5

2:  2  3  1  4  5

3:  3  4  1  5  2
```

```
4:  3  4  2  1  5

5:  3  4  5  2  1

female preference lists are:

1:  4  3  5  2  1

2:  3  4  1  5  2

3:  2  5  1  4  3

4:  1  2  5  3  4

5:  5  4  3  2  1
```

4. Give both types of KMP fail links for the pattern string `0011000011001100`. 10 points

i	pat[i]	fail 1	fail 2
0	0		
1	0		
2	1		
3	1		
4	0		
5	0		
6	0		
7	0		
8	1		
9	1		
10	0		
11	0		
12	1		
13	1		
14	0		
15	0		