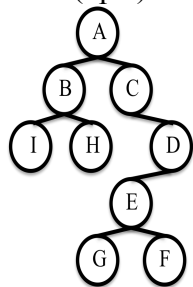# Sample Solutions
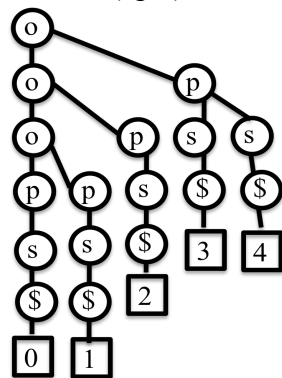## COS 226 – Final Exam – Spring 2009

1. **MST** (8pts)
   1. 4,9,18,19,21,22,23,30
   2. 18,23,21,19,30,4,9,22
2. **KMP** (5pts)
   1. A B A B A C C B A
   2. W: 0   X: 5   Y: 1   Z: 4
3. **Mystery Code** (5pts)
   Answer: d
4. **Acronyms** (8pts)
   SAT: g (a logic problem)
   KMP: c (substring-search algorithm)
   NFA: h (basis for grep)
   DFA: a (basis for KMP algorithm)
   DFS: d (fundamental recursive method)
   BFS: e (for single source shortest path in unweighted graphs)
   PFS: b (general graph searching scheme)
   NP: f (set of all problems checkable in polynomial time)
5. **LZW compression** (4pts)
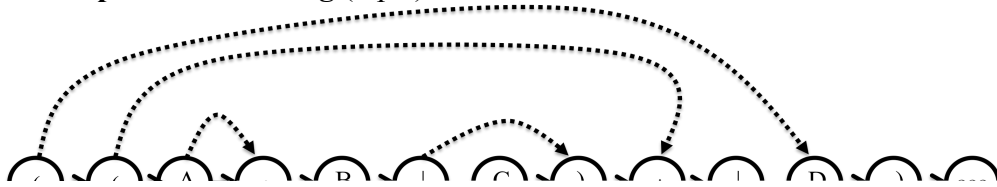   1. Answer: c (square root of N)
6. **2D trees** (6pts)

7. **Suffix TST** (6pts)

8. **String symbol table** (7 pts)
   M-ary trie: b
   BST: a,c,d
   TST: a,b

Red-black tree: a,c

9. **RE pattern matching** (7 pts)

10. **RE pattern matching II** (4pts)

Answer: a

11. **7 sorting algorithms** (14 pts)

Answer: g, c, b, d, f, e, a

12. Convex hull

Next points; current hull

A; A

G; A G

C; A G C

H; A G C H

I; A G I

F; A G F

B; A G F B

D; A G F D

E; A G F E

13. **Strong Components** (3pts)
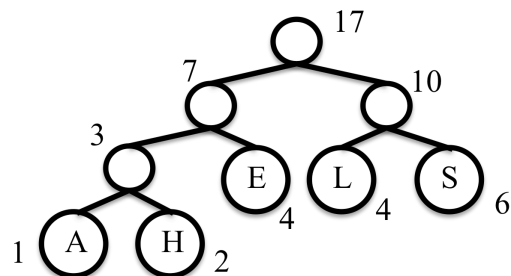   1. First component: A, B
   2. Second component: C
   3. Third component: D,E,F,G

14. **Reduction** (4pts)
   1. Answer: d (Promote them all)

15. **Huffman encoding** (4pts)

16. **Hard problem identification** (9 pts)
   1. Answers: A,B,C,E,G