1. What are the average and worst-case time complexities of quick sort?　(10%)

2. Write a recursive function to determine the height of an n-node binary tree which is represented using links, (i.e., left child, right child, and data). The function takes a parameter which is a pointer to the root of the tree.　(10%)

3. Arrange the following complexities of algorithms from the most efficient (最快的) to the least efficient (最慢的):　(10%)

   $O(n^2)$, $O(1)$, $O(2^n)$, $O(n!)$, $O(\log n)$, $O(n^3)$, $O(n)$, $O(n \log n)$

4. Draw the binary tree whose inorder sequence is C H F A E B G D and preorder sequence is A C F H B E D G.　(10%)

5. If one array were used to hold two stacks S_1 and S_2, explain how you would place them in the array so that each has the greatest possible room for growth?　Draw a picture to help explain if you'd like. (5%)

6. When constructing a binary search tree, a skewed tree, that is, every node of the tree has only one child may result.　Please describe an input for which a skewed tree will be constructed. (10%)

7. Construct a minimum cost spanning tree step by step for the following graph by Prim's algorithm, starting with vertex 1. You must show the order in which the vertices are included in the final solution.　(15%)
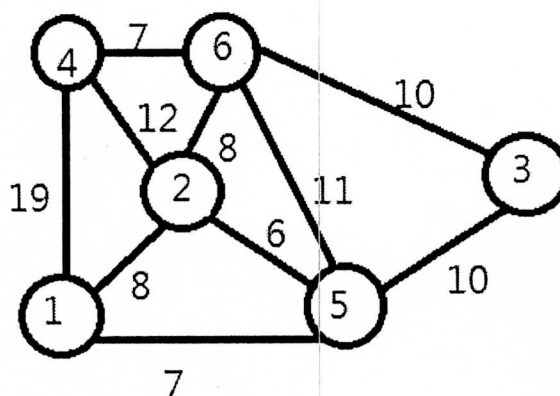
8. The following keys are to be inserted into a hash table of size 11: {25, 42, 96, 101, 102, 162, 196, 19}. Use the hash function H(key) = key **mod** 11, and resolve all collisions by linear probing.　Show the final hash table, and explain the drawbacks of linear probing. (15%)

9. For the input array: 4 8 3 6 2 1 7 5, construct a max heap in linear time.　You must show the contents of the array at each step of the construction process. (10%)

10. Please give an application for stacks.　(5%)