（橫書式） 國立東華大學九十四學年度 碩 士 班招生考試試題

科 目：資料結構 資訊工程學系 共 2 頁 第 1 頁

1. (20%) Please answer the following questions
   a. What is the minimum depth of a binary tree with n nodes
   b. What is a binary search tree
   c. What is the articulation point
   d. What is a stack
   e. What is a B tree
2. (12%)Determine whether the following statements are correct
   a. $7e^n+4n^8+10n^{10}\log n=O(3^n)$
   b. $100000n^{132}+2^n+204n=\theta(2^n)$
   c. $n^{1.01}+n\log n=O(n^{1.01})$
3. (10%) Please analyze the worse case time complexity (in terms of O()) of the following program. Assume, initially, there are n elements in a, i.e., right – left =n-1.

```
int TT(int *a, int x, int left, int right)
   { if (left <=right) {
       int middle=(left+right)/2;
       switch (compare(x, a[middle])) {
          case '>':return TT(a,x,left+1,right);
          case '<':return TT(a,x,left,right-1);
          case '=':return a[middle]; } }
     return –1; }   }
```

4. Please answer the following questions
   (5%) (a) What kind of data representation (array representation or linked representation) will you use to implement a max heap? Why?
   (15%) (b) According to the data representation selected in (b), please write the program for data insertion into a max heap. Please "analyze" the time complexity (in terms of O) of your program.
5. Refer to Figure 1, please answer the following questions
   a. (10%) Explain the main idea of Prim's algorithm. Use Figure 1 as an example to show each stage in Prim's algorithm. What is the time complexity of this algorithm.
   b. (5%) If in graph G, there are n vertices and $n^{1.99}$ edges. Which algorithm (Prim or Kruskal) will you select to get the minimal spanning tree of G? Why?

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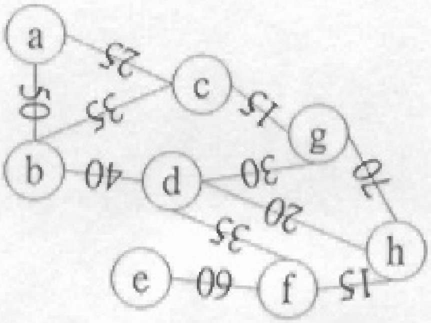

Figure 1.

6. Quick sort
   a. (12%) Please write the quick sort algorithm.
   b. (6%) Use an example to illustrate this method. Moreover, what kinds of inputs will result in the worst cases behavior?
   c. (5%) What is the worst case time complexity of quick sort algorithm?