

## 八十五學年度國立台灣工業技術學院研究所碩士班招生考試

所別：電機工程技術研究所

組別：計算機組

科目：資料結構

1. Consider a set of 6 keys as shown below:  
 $\{63, 50, 99, 82, 150, 15\}$ 
  - (a) Draw the binary search tree by scanning these keys from left to right. (5%)
  - (b) If the following sequence of keys are searched for from the binary search tree, what is the average number of key comparisons required for each retrieval (including unsuccessful ones)? (7%)  
 $\{18, 50, 83, 63, 70, 90, 99, 82, 56, 15\}$
  - (c) Is it possible to construct another binary search tree that gives an average number of key comparisons per retrieval that is smaller than the one obtained in part (b)? If yes, draw any one such binary search tree. Here we refer to the same set of key retrievals as given in part (b). (8%)
2. In general, does *QuickSort* offer good performance, in terms of time, for input files that are almost sorted at the start. Give your argument. (10%)
3. There are two sets,  $S_1$  and  $S_2$ , of numbers, each represented by a singly linked list. The elements of  $S_1$  and  $S_2$  are assumed to be arranged in ascending order in the lists. Now, suppose you are requested to find the union of  $S_1$  and  $S_2$ . What will be your strategy in computing the union, and what will the time complexity be? Let  $m$  and  $n$  denote the lengths of  $S_1$  and  $S_2$ , respectively. You can explain your idea with the assistance of some illustrations. (15%)
4. 請以演算法及圖形表示方式逐步說明如何在一個 doubly linked list 中插入 (insert) 一個新的 node。(假設欲插入之位置在該 list 的中間段而非頭尾。) (9%)
5. 請以圖形表示方式逐步說明依序在一個空的 max heap 內輸入 1、4、2、5、7、9、3、6、8 之後的結果。完成之後，從這個 max heap 中取出 (delete) 一個資料則其值應為何？請再以圖形說明取出資料之後的結果。 (17%)
6. 請以演算法說明如何在一個給定的 weighted undirected graph 中找出 minimal spanning tree。 (15%)
7. 請將下列後置表示式 (postfix) 轉換成前置表示式 (prefix) 與中置表示式 (infix)。再請說明為何中置表示式的括號在另外兩種表示式中未出現。 (14%)
  - (a)  $abc-d+/ea-*c^*$
  - (b)  $ab/c-de^*+ac^*-$

