附件 2：台灣聯合大學系統 94 學年度學士班轉學生考試命題紙

科目__資料結構____類組別__09__共__二__頁第__一__頁 *請在試卷答案卷（卡）內作答

1. Show that the following statements are incorrect: (10%)

   A. $3^n = O(2^n)$

   B. $n^3 2^n + 6n^2 3^n = O(n^2 2^n)$

2. Show that the worst case time complexity of quick sort is $O(n^2)$. (10%)

3. A merge sort implementation is given below

```
void merge_sort(int list[], int n) {
  int len = 1;
  int extra[MAX_SIZE];
  while (len < n) {
    pass(list, extra, n, length);
    len *= 2;
    pass(extra, list, n, length);
    len *= 2;
  }
}
```

   A. Describe what pass should do. (5%)

   B. Write down the pass procedure in C. (5%).

   C. Prove that the time complexity of merge_sort is O(n log n). (10%)

4. Write an iterative C function to delete the largest key from a binary search tree. (10%)

科目 資料結構 類組別 D9 共 二 頁第 二 頁 *請在試卷答案卷（卡）內作答

5. *10%* **Union-Find operation:**

   (a) T is a tree that has n nodes. T is created by Union operation when weighting rule is applied. Show that no nodes in T have level greater than $\lfloor \log_2 n \rfloor + 1$.

   (b) Show that this bound is tight.

6. *10%*

   (a) Define a 2-3 tree.

   (b) What is the minimum height of an 2-3 tree of n nodes.

   (c) In what cases the height of the tree changes.

   (d) How to modify a 2-3 tree to support the search of kth largest key. You need to explain how to do the search by using you modified 2-3 tree.

7. *10%*

   (a) You are given a graph, G, that represents a computer network. How can you determine any pair of computers can talk to each other?

   (b) Briefly describe the algorithm for determining the "articulation points" in an graph.

8. *10%*

   (a) Is the tree in Figure 1 a DEAP? If you don't think so, make a correction to make it a DEAP.

   (b) Insert 9 into the above DEAP (or the modified DEAP).

   (c) Then insert 10 into the DEAP.

9. *10%* Design a heap structure to support insert arbitrary and delete median $\lfloor n/2 \rfloor$.

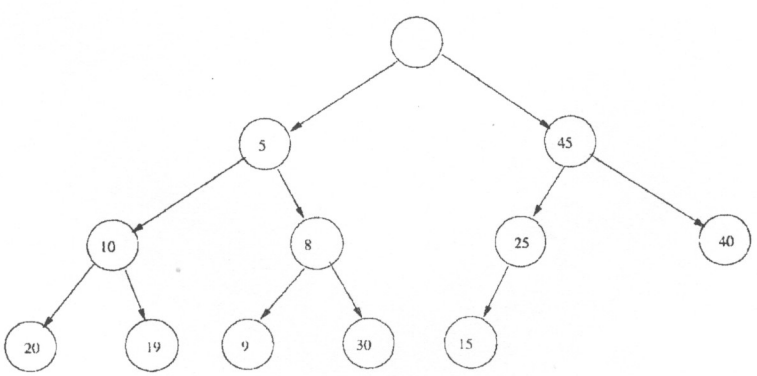

Figure 1: