

# 國立交通大學試題紙

科目：演算法 (A)

日期：96 年 7 月 27 日 第 1 頁 共 1 頁

請 “✓” 明    ✓不可看書    可看書

\* 請將答案依題號順序寫入答冊

12.5 for each problem.

1. Mr. A and Mr. B both tried to solve the same problem. A's solution was a divide and conquer approach. He divided the problem into 2 subproblems of equal size, recursively solved the two subproblems, and merging the solutions to the subproblems to get the solution to the original problem. The dividing and merging time needed  $\Theta(n \log n)$  time. B solved the problem in two steps, and the computing time was  $\Theta(n \log^2 n) + O(n \log n)$  time. Which algorithm is more efficient? Or they are the same? Give me your reasons.
2. Suppose that we have a linear decision tree  $T$ . If we can argue that  $T$  can solve sorting problem than  $T$  can solve problem  $A$ . In this case, can we conclude that problem  $A$  has lower bound  $\Omega(n \log n)$ ? And your reasons please.
3. Try to derive the recursive formula for the LCS (Longest Common Subsequence), and compute one of the LCS for the two sequences,  $X = ABCBDAB$  and  $Y = BDCABA$ . (You will not get any credit if you just write down a LCS such as  $BCBA$ ).
4. Vector in C++ STL library is implemented by using the dynamic table approach. When we are inserting an item into a full table, the table size is doubled. We then copy everything in the old table into the new, large table. And then we insert the item. Suppose that we have only insertion operation, given the potential function  $\Phi(T) = 2 \cdot \text{num}[T] - \text{size}[T]$ , show that inserting an element takes  $O(1)$  amortized cost. ( $\text{num}[T]$ , number of items in the table,  $\text{size}[T]$  the size of the table. )