科目：資料結構與演算法　適用：資工系三

編號：811

考生注意：
1.依次序作答，只要標明題號，不必抄題。
2.答案必須寫在答案卷上，否則不予計分。
3.限用藍、黑色筆作答；試題須隨卷繳回。



The following problems can be answered either in Chinese or in English.

**Problem 1 (15%)** Show how to sort $n$ numbers with worst-case time complexity $\Theta(n \log n)$ under the comparison model.

**Problem 2 (15%)** Solve the following recurrence:

$$T(n) = 2T\left(\frac{n}{2}\right) + 2n + 1, \quad \text{for } n > 0.$$

**Problem 3 (15%)** Describe *the abstract data* type of stacks.

**Problem 4 (15%)** Prim's algorithm solves the minimum spanning tree problem. Show how to use *the priority queue* to implement Prim's algorithm.

**Problem 5 (20%)** Let $A = a_1 a_2 \cdots a_m$ and $B = b_1 b_2 \cdots b_n$ be two integer sequences. Describe an algorithm that can find the length of the longest common subsequence of $A$ and $B$ in time $O(mn)$.

**Problem 6 (20%)** Suppose we have a million of telephone numbers. Each number has exactly 10 digits and is associated with the name of its owner. You want to build a system that can, given a phone number, find the name of its owner as fast as possible. Please describe a data structure that can achieve this requirement.