科目：資料結構與演算法 適用：資工系

編號：413

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。

1. a. How many different binary trees can be made from 3 nodes? Draw and explain your answer. (10%)
   b. How many different binary search trees can be made from 4 nodes? Draw and explain your answer. (15%)

2. The sequence $F(n)$ of Fibonacci numbers is defined by the recurrence relation:
   $F(n) = F(n-1)+F(n-2)$,
   with seed values
   $F(0) = 1$, and $F(1)=1$.
   a. If using the recursion method to calculate the value of $F(14)$, how many times of additive operations will be performed? Explain your answer briefly. (15%)
   b. If using the dynamic programming method to calculate the value of $F(14)$, how many times of additive operations will be performed? Explain your answer briefly. (15%)

3. For an AVL tree,
   a. Write C-like pseudo codes to determine the rotation type when a new node is inserted. Explain your algorithm briefly. (15%)
   b. Draw and explain the L-R and R-R rotations. (15%)

4. Explain the difference between Kruskal's algorithm and Prim's algorithm for the minimum spanning tree problem. (15%)