

國立中央大學 資訊工程學系
九十四學年度 碩士在職專班 招生入學考試命題紙

科目： 程式設計與資料結構

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1. (15%) Show the result of inserting the followings into an initially empty binary search tree: 30, 35, 22, 89, 11, 71, 62, 88, 99.
2. (15%) Given two positive integers i and j , the greatest common divisor (gcd) of i and j , $\text{gcd}(i, j)$ is the largest integer k such that $(i \% k = 0)$ and $(j \% k = 0)$. Develop a recursive method that returns the gcd of i and j .
3. (15%) Insert 2, 4, 1, 5, 3, 9, 6 to an initially empty AVL tree. Show the result.
4. (15%) The array "1 3 4 5 8 9 6" denotes a "min-heap".
 - (a) Draw a sketch to show the heap.
 - (b) Draw a sketch to show the heap after inserting 2 to it.
5. (10%) Insert 5, 2, 7, 0, 3, 4, 6, 1, 8, 9 to an initially empty 2-3 tree. Show the result.
6. (10%) What is the Big-Oh estimate of the below:

```
for (int j = 0; j < n; j++)
    for (int k = 0; k < n; k++)
        gui.println(j + " " + k);
```
7. (5%) (a) Under what circumstances should an application chooses to use ArrayList?
(5%) (b) Under what circumstances should an application chooses to use LinkedList?

Note that ArrayList and LinkedList are two reusable classes in the Java collection framework. ArrayList uses array to implement list, while LinkedList uses linked structure to do it.

8. (10%) Show the Big-Oh time estimates of insertion or deletion in ArrayList and LinkedList, respectively. Explain your estimates.