# 淡江大學 104 學年度碩士班招生考試試題 37

系別：資訊工程學系 B 組　　科目：資料結構

考試日期：3 月 8 日(星期日) 第 2 節　　本試題共 九大題，　一　頁

1.(15%)How many steps of
"if(n)"、
"return RSUM(list,n – 1) + list[n – 1]" and
"return list[0]"
are done in the recursive function RSUM of Program 1, where the steps/execution of each instruction is 1.

```
float RSUM(float list[], int n)
{if (n) return RSUM(list,n – 1) + list[n – 1];
    return list[0];}
```

Program 1

2.(10%)Identify the following equalities are correct or incorrect.
(a) $n! = O(n^n)$; (b) $6n^3/(\log n +1)= O(n^3)$; (c) $10n^3 + 15n^4 +100n^2 2^n = O(n^2 2^n)$ (d) $n^2 / \log n = \Theta(n^2)$ (e) $n^3 + 2^{100} n^2 = \theta(n^3)$

3.(15%)Implement a STACK using one queue with its ADD and DELETION operations. (You show describe the process of PUSH operation and POP operation based on ADD and DELETION operations of Queue)

4.(15%)Describe two disadvantages and three advantages of the linking list structure in comparing with the array structure.

5.(10%)A n×n symmetric matrix M is stored with its upper diagonal part stored in a one dimensional array with **row-major** order, i.e. the first element M(1, 1) stored in A[0], M(1, 2)=M(2, 1) stored in A[1], M(1, 3)=M(3, 1) is A[2], M(2, 2) is A[n]. Let M(*i*, *j*) be stored in A[*k*], write a single expression for *k* in terms of *i* and *j*.

6.(10%)Extend the array representation of a complete binary tree to the case of complete trees whose degree is *d*, *d*>1. Develop the position formulas for the parent and children of the node stored in position *i* of the array whose index start at 0.

7. (5%) Given the postorder sequence : **HIDEBFGCA** and the inorder sequence : **HDIBEAFCG** of the same binary tree. Write the preorder sequence of this tree。

8.(10%)What are the major difference between Binary Search and Binary Search Tree?

9(10%)Given the following **MAX** heap represented with array structure, show the new **MAX** heap by the **array form** after removing the root.

| 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 8 | 7 | 5 | 3 | 2 | 4 | 1 |