編號：E 266　系所：電腦與通信工程研究所甲組　科目：系統程式

本試題是否可以使用計算機：□可使用 ， ☑不可使用　（請命題老師勾選）

⚠ 注意事項：

　1. 本試題除各題另有限制之外，可使用 Pseudo Code，Java、C 或 C++作答。

　2. 請依題號序作答於答案紙。作答時可不必抄題，但請務必將各題之完整題號(例：*(1-A)*或*(2-B)*等等)標示清楚。

　3. 本試題共計二頁。配分標示於各題或各小題。不可使用電子計算機。

📋 試題：

1. Explain the following terms: (3 points each)

　　(1-a) Binomial tree　　*(1-b)* Type-1 grammar　　*(1-c)* LL(k) parsing

　　(1-d) Hashing　　*(1-e)* Error recovery

2. For each of the following statements, indicate TRUE or FALSE. (1 points each)

　　(2-a) Merge sort is more efficient than selection sort in all cases.

　　(2-b) A heap can be used to represent a binary search tree.

　　(2-c) In representing graphs, the adjacency matrix always uses more storage than the adjacency lists do.

　　(2-d) When the worst case for quick sort is very likely to happen, it is better to use bubble sort instead.

　　(2-e) A biconnected graph is a connected graph that has two articulation points.

　　(2-f) The maximum number of internal nodes in a binary tree of depth k is 2^k-1.

　　(2-g) Given that $f_1(n) = O(g(n))$ and $f_2(n) = O(g(n))$ then $f_1(n) = f_2(n)$.

　　(2-h) Recursive-descent parsing is one example of bottom-up parsing method.

　　(2-i) LR(0) parsing method can be used to parse ambiguous grammar.

　　(2-j) For the same source program, the object code generated by a two-pass compiler is less efficient than that generated by a three-pass compiler.

3. A sparse matrix is represented by a one-dimension array holding its non-zero elements by the structure shown at right. In addition, the first element of the array holds the number of rows, columns, and the number of non-zero elements of the matrix. Given two sparse matrices A and B of dimension $M \times N$.

```
typedef  struct {
    int   col;
    int   row;
    float value;
} element;
```

The number of non-zero elements in A is α and that of B is β. Based on the above, answer the following:　(5 points each)

(3-a) Write a program in C language to perform matrix addition of $A = A + B$.

(3-b) Analyze and give the time complexity of your program in *(3-a)*.

(3-c) Suppose that the number of bytes needed to hold an integer and a floating-point number are the same, analyze and give the conditions on the values of α and β that make the representation of matrices A and B an efficient way.

4. On compiler construction, give your answer to the following: (5 points each)

　　(4-a) Define the lexical rules for floating-point numbers by regular expression.

　　(4-b) Define a DFA that can recognize floating-point numbers.

（背面仍有題目，請繼續作答）

5. (5-a) What is VMM (Virtual Machine Monitor)?(5points)

　　(5-b) How does it work?(15points)

　　(5-c) Give one example of its potential applications. (5points)

6. (6-a) What is a thread? What is the relation between a process and a thread? (5points)

　　(6-b) Why do we need to use threads? (5points)

　　(6-c) Give an example to explain how we can make use of threads. (5points)

7. Explain how a computer makes use of double-buffering to improve its performance. (10points)