

國立高雄應用科技大學
100 學年度碩士班招生考試
電子工程系（丙組）

准考證號碼 （考生必須填寫）

資料結構

試題 共 3 頁，第 1 頁

注意：a. 本試題共 6 題，共 100 分。

b. 作答時不必抄題。

c. 考生作答前請詳閱答案卷之考生注意事項。

1. Calculate the time complexity of the following codes. (20%)

- (1)

```
int F1(int n)
{
    int sum = 0;
    for(int i = n; i > 0; i--)
        sum = sum + i*i;
    return sum;
}
```
- (2)

```
int F2(int n)
{
    int sum = 0;
    for(int i = 1; i < n; i++)
        for(int j = 1; j < n; j = j*2)
            sum = sum + j;
    return sum;
}
```

(3) What is the value of F1(5)?

(4) What is the value of F2(10)?

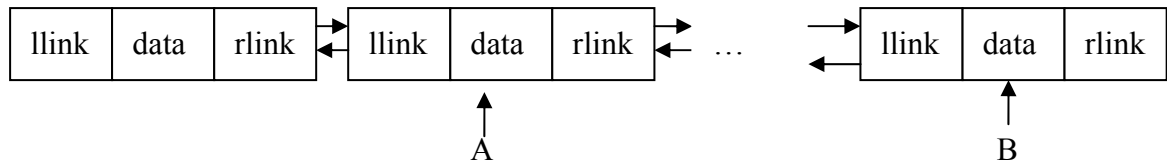
2. Given the expression $(A + B * C) * D - E + (F - G) / H$
- (1) Please construct the corresponding binary expression tree. **(5%)**
 - (2) Give the postfix expression of the expression. **(5%)**
 - (3) Given that $A = 2, B = 4, C = 1, D = 6, E = 9, F = 8, G = 3, H = 5$, to evaluate the postfix expression obtained from (2). Please show the evaluating process step by step. (Note: applying stack) **(10%)**
3. Consider a hash table of 7 buckets, and a hash function $h(x) = x \bmod 7$. Given input 213, 312, 123, 321, 132, 231.
- (1) If collision happens, try to apply linear probing scheme. Please find the result of hash table. **(10%)**
 - (2) If collision happens, using linked list to solve. Please find the result of hash table. **(10%)**
4. There is a directed graph G, represented by the following weighted adjacency matrix m.

$$m = \begin{matrix} & \begin{matrix} a & b & c & d & e & f \end{matrix} \\ \begin{matrix} a \\ b \\ c \\ d \\ e \\ f \end{matrix} & \begin{bmatrix} 0 & 50 & 70 & \infty & \infty & \infty \\ \infty & 0 & 40 & 30 & \infty & \infty \\ \infty & \infty & 0 & 25 & 15 & \infty \\ \infty & \infty & \infty & 0 & 7 & 15 \\ \infty & \infty & \infty & \infty & 0 & 8 \\ \infty & \infty & \infty & \infty & \infty & 0 \end{bmatrix} \end{matrix}$$

Where $m[a][b] = 50$ indicates that node a and node b is connected and the distance between a and b is 50. And $m[b][a] = \infty$ means that the node b cannot be connected directly to node a. And $m[a][a] = 0$ means the node a.

- (1) Draw the directed graph. **(5%)**
- (2) Applying the Dijkstra algorithm to find the shortest path from a to f. **(10%)**

5. Write a piece of code that **swaps** two nodes pointed by A and B, in a doubly link list shown in the following figure. (15%)



6. Consider the array shown below.

A[i]	A[1]	A[2]	A[3]	A[4]	A[5]	A[6]	A[7]	A[8]	A[9]
value	50	40	30	29	18	25	20	6	9

- (1) Draw the corresponding binary tree T. (5%)
- (2) And we can find that the tree T is a max heap. Please do the heap operation DELETE(50), and show each step of the delete operation. (5%)