95年度聖約翰科技大學
碩士班暨碩士在職專班招生考試試題

所（系）/組別：電機工程系/丙組
科目：資料結構

注意：
1. 本試題計有題，每題分，共100分。
2. 答得者，不倒扣題分；未答者，得零分。
3. 有關數值計算的題目，以最接近的答案為準。
4. 可攜帶不具通訊、翻譯及貯存功能之計算機。

Pointer

- Consider the following program. Write the result of each output. (10%)

```
#include <stdio.h>
void main(void)
{
    int x=1, z=2;
    int *y;
    *y=3;
    z = z + 1;
    x = x + *y;
    printf(" x = %d\n", x);
    printf("*y = %d\n", *y);
    y = &x;
    z = z + *y;
    printf("z = %d\n", z);
    printf("*y = %d\n", *y);
    &z = y;
    printf("z = %d\n", z);
}
```

Link list

二. Assume that Fig 1 represents a link list and its data structure. (15%)
(1) What is the output in the following program. (5%)
(2) Write a function Add to insert a char into the link list. (5%)
(3) Write a function Del to delete a char in the link list. (5%)

```
void main()
{
    Struct node { char data;
    struct node *next;};
    struct node *head, *ptr;
    int count;
    ptr=head;
    count=0;
    while (ptr->next != null)
    {
        count=count+1;
        ptr = ptr->next;
        printf("%c\n", ptr->data);
    }
    printf(" count = %d\n", count);
}

head
  a   b   c   d   e
```

Fig 1.
Time Complexity
三. Consider the following function `math()`. (15%)
(1) What is the purpose of the function `math()`. Please explain. (10%)
(2) What is the worst case time complexity of the function `math()`. (5%)

```c
void math (int a[][1], int b[][1], int c[][1], int n)
{
    int i, j, k, sum;
    for (i=0; i < n; i++)
        for (j=0; j < n; j++)
            {
                sum = 0;
                for (k=0; k < n; k++)
                    sum = sum + a[i][k] * b[k][j];
                c[i][j] = sum;
            }
}
```

Tree
四. Given the infix expression \((3+5)*2/(3+5*2)\). Please answer the following questions. (15%)
(1) Write the postfix expression. (5%)
(2) Draw the binary expression tree according to the infix expression \((3+5)*2/(3+5*2)\). (5%)
(3) Write the prefix expression. (5%)

Array
五. Given that `int Array[6][6]`. Assume that `Array[0][0]` address is 1000. What are the address of `Array[0][5]` and `Array[5][1]` respectively? (Note: integer is 2 bytes) (5%)
Recursive
六. (1) What is the recursive. Please explain? (5%)
(2) What is the result of math(4). (5%)

```c
int math(int n)
{
    int x, y;
    if (n <= 1)
        return(n);
    x = math(n-1);
    y = math(n-2);
    return(x+y);
}
```

Sorting
七. (1) What is heap tree? Please explain. (5%)
(2) Show in detail that heapsort process the input 7 9 2 8 1 4 6 3. (10%)

Graph
八. Assume that graph G=(V,E). V is vertex set and E is edge set. (15%)
(1) Let S={-6,-3,0,3,6,9}. Draw the graph G whose vertex set is S and such that \( ij \in E(G) \) for \( i,j \in S \) if \( i+j > 0 \). (10%)
(2) Show in detail breadth-first spanning tree of G (Note: root is vertex 0). (5%)