國 立 雲 林 科 技 大 學
系所：資工系
101 學年度碩士班暨碩士在職專班招生考試試題　科目：計算機概論(2)

I. 單選題，共九分，每題三分

1. Given the following template function definition, which of the following is not a valid invocation of the function?

```
template <class T>

void swap(T& left, T& right)
{
   //implementation goes here, not relevant to the question
}

int int1, int2;
float flt1, flt2;
char ch1, ch2;
string s1, s2;
```
   a. swap(s1,s2);
   b. swap(int1, int2);
   c. swap(ch1, ch2);
   d. swap(int1, ch2);

2. What is the output of the following code fragment?
```
int v1=2, v2=-1, *p1, *p2;
p1 = & v1;
p2= & v2;
p2=p1;
cout << *p2 << endl;
```
   a. 2
   b. -1
   c. -2
   d. 1

3. Given the following function declaration

```
void insert( NodePtr afterMe, int num);
//PRE: afterMe points to some node in the non-empty list
//POST: A new node containing num is inserted after afterMe.

void insert(NodePtr afterMe, int num)
{
    // which of the following function definitions correctly
implement this          //function?
}
```

```
a. afterMe->link = new Node;
   afterMe->link->data = num;
   afterMe -> link ->link=afterMe->link;
b. NodePtr tmp=new Node;
   tmp-> data = num;
   afterMe -> link = tmp;
   tmp->link = afterMe -> link;
c. NodePtr tmp=new Node;
   tmp-> data = num;
   tmp->link = afterMe -> link;
   afterMe -> link = tmp;
d. NodePtr tmp=new Node;
   tmp-> data = num;
   afterMe -> link = tmp;
   tmp->link = NULL;
```

II.簡答題 (91%)

1. (3%) Given the following code fragment, what is the stopping condition(s)?

```
int f1(int x, int y)
{
    if(x<0 || y<0)
        return x-y;
    else
        return f1(x-1,y) + f1(x,y-1);
}
int main()
{
    cout << f1(1,2)<<endl;
    return 0;
}
```

2. (15%) Please describe the concept of ADT. Give the Stack ADT and Queue ADT.

3. (10%) Given the frequency of characters as shown in Table 1, please draw the Huffman coding tree and generate the final codes for each character.

Character	A	B	C	D	E
Frequency	18	11	11	26	33

Table 1. Frequency of Characters

4. (3%) What is wrong with the following definition of headInsert, which inserts a node to the head of a linked list?

```
struct Node
{
  int item;
  Node* link;
};

typedef Node* NodePtr;

void headInsert(NodePtr& head, int data)
{
  NodePtr tmp = new Node;
  tmp->item = data;
  head->next = tmp;
  tmp->next = head->next;
}
NodePtr head;
headInsert(head, 4);
```

5. (10%) Please write codes to implement QuickSort. Analyze the worst case running time and indicate when the worst case will happen.

6. (10%) Write a C/C++ recursive function that return the value of x^{-n}. (hint: $x^{-n} = \dfrac{1}{x^n}$)

7. (10%) Write a function definition for a function called des_order that takes three arguments of type int. The function returns true if the three arguments are in descending order; otherwise, it returns false. For example, des_order (3,2,1) and des_order (6,3,3) both return true, while des_order (1,2,3) returns false.

8. (10%) Write a void function definition for a function called add_tax. The function has two formal parameters: tax_rate, which is the amount of sales tax expressed as a percentage, and cost, which is the cost of an item before tax. The function changes the value of cost so that it includes sales tax.

9. (5%) One algorithm need 10 basic operations to process an input of size n, and another algorithm needs 25n basic operations to process the same input. Which of the two algorithms is more efficient?

10. (10%) Write a function whose prototype is
```
void exchange (int *p, int *q);
```
that takes two pointers to integer variables and exchanges the values in those variables.

11. (5 %) What is the output of the following program?

```cpp
#include <iostream>
using namespace std;

void test(int=6, int=1, int=5);

int main( )
{
  test ( );
  test (2);
  test (3,3);
  test (9, 7, 8);
  return 0;
}

void test (int first, int second, int third)
{
  first +=4;
  second+=5;
  third +=6;
  cout << first << " " << second << " " << third <<endl;
}
```