國立雲林科技大學 110 學年度
碩士班招生考試試題

系所：資工系
科目：計算機概論(2)

1. What is time complexity of fun()? (5%)

```
int fun(int n)
{
    int count = 0;
    for (int i = n; i > 0; i /= 2)
        for (int j = 0; j < i; j++)
            count += 1;
    return count;
}
```

(a) O(n^2) (b) O(nLogn) (c) O(n) (d) O(nLognLogn)

2. Predict output of following program (5%)

```
#include <stdio.h>
int fun(int n)
{
    if (n == 4)
        return n;
    else return 2*fun(n+1);
}
int main()
{
    printf("%d ", fun(3));
    return 0;
}
```

(a) 4 (b) 8 (c) 16 (d) Runtime Error

3. Consider the following recursive function fun(x, y). What is the value of fun(4, 3) (5%)

```
int fun(int x, int y)
{
    if (x == 0)
        return y;
    return fun(x - 2,   x + y);
}
```

(a) 13 (b) 12 (c) 9 (d) 10

4. What is the result of the following postfix expression? (5%)
   ab*cd*+ where a=2, b=1, c=3, d=4.
   (a) 16 (b) 12 (c) 14 (d) 10

5. Which is the most appropriate data structure for reversing a word? (5%)

    (a) queue (b) stack (c) tree (d) graph

6. Assume that an integer and a pointer each takes 4 bytes. Also, assume that there is no alignment in objects. Predict the output of following program. (5%)

```
#include<iostream>
using namespace std;
class Test
{
    static int x;
    int *ptr;
    int y;
};
int main()
{
    Test t;
    cout << sizeof(t) << " ";
    cout << sizeof(Test *);
}
```

(a) 12 4 (b) 12 12 (c) 8 4 (d) 8 8

7. Which one of the following array elements represents a binary min heap? (5%) Please explain the reasons. (5%)

    (a) 12 10 8 25 14 17 (b) 8 10 12 25 14 17 (c) 25 17 14 12 10 8 (d) 14 17 25 10 12 8

8. What is the output of following function for start pointing to first node of following linked list?

    1->2->3->4->5->6   (10%)

```
struct Node {
    int data;
    struct Node* next;
};
void fun(struct node* start) {
    if(start == NULL)
        return;
    printf("%d   ", start->data);
    if(start->next != NULL )
        fun(start->next->next);
    printf("%d   ", start->data);
}
```

(a) 1 4 6 6 4 1 (b) 1 3 5 1 3 5 (c) 1 2 3 5 (d) 1 3 5 5 3 1

9. (5%) What were the two major motivations for virtual memory?

   (a) Allow efficient and safe sharing of memory among multiple programs.

   (b) Remove the programming burdens of a small, limited amount of main memory.

   (c) Predict the presence and creation of faults, allowing the hardware component to be replaced before it fails.

   (d) Reduce the miss rate of a disk cache.

10. (5%) The steps of booting a computer is performed in a specific order. Please give the right order of the following operations. (a) Operating system is loaded (b) Operating system runs (c) Bootstrap program runs (d) Bootloader executes

11. (10%) Show the IEEE 754 binary representation of the number of -5_{ten} in single precision.

12. (10%) For an 8-bit CPU, what is two's complement representation of 2?

13. (10%) Assume a system uses five protocol layers. If the application program creates a message of 50 bytes and each layer (including the fifth and the first) adds a header of ten bytes to the data unit, what is the efficiency (the ratio of application-layer data bytes to the number of bytes transmitted) of the system?

14. (10%) Assume $t0 holds the value 0x00101000. What is the value of $t2 after the following MIPS instructions? (5%)

```
           slt $t2, $0,  $t0
           bne $t2, $0,  ELSE
           j    DONE
ELSE:      addi $t2, $t2, 2
DONE:
```