國立中央大學　資訊工程學系
95 學年度 碩士在職專班 招生入學考試命題紙

科目：　計 算 機 概 論　　第一頁　共一頁

1.Consider a C/C++ function calculating Fibonacci numbers (f(n)=f(n-1)+f(n-2), f(1)=1, f(0)=1)

```
/* fibind indicate the ?th fibonacci number */
/* for example: fibonacci(2)=2; fibonacci(3)=3; fibonacci(4)=5;

unsigned long fibonacci(unsigned fibind)
{
    unsigned long result;
    if (fibind == 0 || fibind == 1)
        return (__A__);
    else
        {
        result = fibonacci(__B__) + fibonacci(__C__);
        cout<< result;
        }
    return(result);
}
```

---

a) (15%)Fill the blank A,B,C, so that the function implement fabonacci series correctly. (the 0th and 1st fibonacci are both 1);

b) (10%) What is the way to pass arguments to fibonacci() function, call by value or call by reference? Compare this two mechanisms.

c) (20%) Instead of recursion, use only loop(for, while, or do while) to implement function fibonacci().

2.(15%) Explain what is Object-oriented programming language and its important features.

3. (20%) Suppose a computer has 1024 MB of memory, and each word is 4 bytes (word is addressable, not byte).

a) (5%) How many bits are needed to represent an address?

b) (8%)An array stores 100 standard pointers (each occupy memory by "words"), how much memory does this array occupy?

c) (7%)Another array stores a set of elements. Each element is 2 words. Suppose the array starts at address 600 (in decimal representation), what is the address of array's 7-th element in hexadecimal notation?

4. (20%) a)(5%) Change the decimal number 57 to binary, octal, and hexadecimal representations.

b)(5%) if the result of ((10111011) XOR (00101101)) is in 2's complement format, what's the decimal representation of that result?

c)(10%) Use 8 bit 2's complement format to represent: (i) 20; (ii)-32; (iii)((20 -32)*4)

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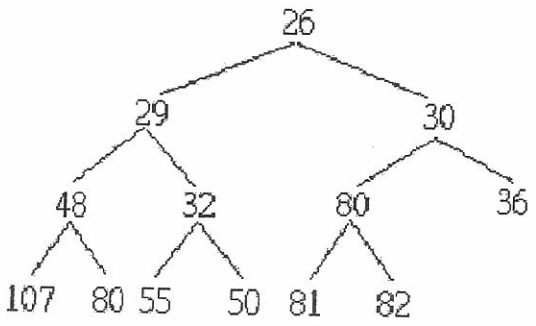
科目：　程式設計與資料結構　

1. f(1)=f(2)=1,　f(n)=f(n-1)+f(n-2)
   (a)Please write a *iterative* program to compute f(12). (5%)
   (b) Please write a *recursive* program to compute f(15). (5%)
2. (a) Design a data structure and write a program to convert an expression from infix including parentheses to postfix. (b) Use the example below to illustrate your program. A + (((B – C) * (D – E) + F) / G) $ (H – J)　(20%)
3. Use pointer variables to implement list pointers. (a) Please define the type of a pointer and a node. (b) We assume that struct node and NODEPTR have been declared as (a). A queue is represented as a structure:

```
Struct queue {
    NODEPTR front, rear;
            };
 struct queue q;
```

Please write programs to insert an element into a queue insert (q, x) and delete the first element from a queue remove (q). (20%)

4. Suppose v is an element with one child in a red-black tree. Explain why v must be black and v's child must be red leaf. (15%)
5. Show the resulting heap after each of the following alterations made, consecutively, to the following heap. (20%)



a. add(28);
b. add(27);
c. removeMin();
d. removeMin();
e. removeMin();

6. In open addressing, with the quotient-offset collision handler, insert the following keys into a table of size 13: (15%)

20
33
46
22
26
202
140
508
9

Here are the relevant remainders and quotients:

key	key % 13	key / 13
20	7	1
33	7	2
49	10	3
22	9	1
26	0	2
202	7	15
140	10	10
508	1	39
9	9	0

國立中央大學　資訊工程學系
95 學年度 碩士在職專班 招生入學考試命題紙

科目：　數 位 設 計　　第一頁 共 一 頁

1. Use Karnaugh map to simplify the Boolean function $F(A, B, C, D) = \Sigma m\ (0, 1, 4, 5, 12, 13)$ in sum-of-products form. (10%)

2. Determine the prime implicants and essential prime implicants of the following Boolean function: $F(A, B, C, D) = \Sigma m\ (0, 1, 4, 5, 12, 13)$. (10%)

3. Convert the function $wx'y' + yw'z' + yxz + yxw$ into 3-input NAND gates. (15%)

4. Design a 4-bit carry-look-ahead (CLA) generator. (15%)

5. Using two 4:1 multiplexers to implement a full-adder. (15%)

6. Show how to implement a D flip-flop starting with a J-K flip-flop. (15%)

7. Design a three flip-flop counter that counts in the following sequence: 0, 2, 7, 4, 6, 3, 1, and repeat. (20%)

國立中央大學　資訊工程學系
九十五學年度 碩士在職進修專班 招生入學考試命題紙

科目：　離 散 數 學　　第一頁 共　頁

1. (25 Points)

Let p, q, r be the following sentences: (10 points)

p: " John is at the office."

q:" Joan is at the office."

r: "Laura is at the office."

Use logical connectives to express the following three sentences (represent the given statement symbolically):

(A) "John is not at the office" (7 points)

(B) "If Joan and Laura are at the office then John is at the office." (8 points)

(C)"If John is at the office the either Joan or Laura is at the office." (10 points)

2. (25 Points)

If ~ denote an equivalence relation on a set A, the equivalence class of an element a $\in$ A is the set $\bar{a}=\{ x \in A \mid x \sim a \}$.

Let A = { 0, 2, 4, 8, 16, 32}. For a, b $\in$ A, define a ~ b if and only if a*b is a perfect square (that is, the square of an integer).

(a) What are the ordered pairs in this relation? (13 points)

(b) For each a $\in$ A, find $\bar{a}=\{ x \in A \mid x \sim a \}$ (12 points)

3. (25 Points)

(A) Find a necessary and sufficient condition on a natural numbers *m* and *n* in order for $K_{m,n}$ to be Eulerian. Prove your answer. (12 points)

(B) Find a necessary and sufficient condition on a natural numbers *m* and *n* in order for $K_{m,n}$ to have an Eulerian trail. Assume *m* <= *n*. Prove your answer. (13 points)

4. (25 Points)

A sequence is defined recursively by $a_0 = 2, a_1 = 3$ and $a_n = 3a_{n-1} - 2a_{n-2}$ for $n \geq 2$.

(a) Find the first five terms of this sequence. (5 points)

(b) Guess a formula for a_n. (7 points)

(c) Verify that your guess in (b) is correct. (5 points)

(d) Find a formula for a_n which involves only one preceding term. (8 points)