

臺北市立大學

105 學年度研究所碩士班入學考試試題

班 別：資訊科學系碩士班（資訊科學組）

科 目：計算機概論（含程式設計）

考試時間：90 分鐘【08：30—10：00】

總 分：100 分

不得使用計算機 或任何儀器。

※ 注意：不必抄題，作答時請將試題題號及答案依照順序寫在答卷上；
限用藍色或黑色筆作答，使用其他顏色或鉛筆作答者，所考
科目以零分計算。（於本試題紙上作答者，不予計分。）

一、單選題（每題 2 分，共 30 分）

1. The **program counter**

- (A) stores the address of the instruction that is currently being executed
- (B) stores the next instruction to be executed
- (C) stores the instruction that is being currently executed
- (D) stores the address of the next instruction to be executed

2. The **complexity** of a problem is **$O(\log_{10} n)$** and the computer executes 1 million instructions per second. How long does it take to run the program if the number of operations is 10000?

- (A) 1 microsecond
- (B) 2 seconds
- (C) 3 microseconds
- (D) 4 microseconds

3. A process in the **running state** goes to the **waiting state** when

_____.

- (A) it requests I/O
- (B) it gets access to the CPU
- (C) it finishes running
- (D) it enters memory

4. A list contains the following elements:

57 8 26 44 13 23 7 98.

The value of the elements in the list after 2 passes of some **sort** is

7 8 26 44 13 23 57 98,

Which sorting algorithm is applied?

- (A) selection sort (B) bubble sort
- (C) insertion sort (D) none of the above

5. Consider searching for a given value in a sorted array. Under which of the following circumstances will **sequential search** be **faster than binary search**?

- (A) The value is in the first element of the array
- (B) The value is in the last element of the array
- (C) The value is in the middle element of the array
- (D) Sequential search will never be faster than binary search

6. Which of the following is not one of the bus signal groups?

- (A) Control (B) Address (C) Data (D) Fetch

7. Which tool is used to reorganize clusters so as to minimize drive head movement?

- (A) Disk Defragmenter utility (B) FAT
(C) Sequential Access utility (D) NTFS

8. The _____ contains instructions and data that provide the startup program for a computer.

- (A) RAM (B) CDROM (C) BIOS (D) CPU

9. Which one is not a compiler?

- (A) GNU Compiler Collection (GCC) (B) Opera
(C) Psyc (D) Javac

10. Which one is not a programming language?

- (A) Python (B) Haskell (C) JAVA (D) Safari

11. What is the “worst-case” time complexity of the Merge Sort?

- (A) $O(n \log n)$ (B) $O(n)$
(C) $O(n^2)$ (D) None of the above

12. 以 16 位元表示 2 補數的資料，其能表示的最小值及最大值範圍為
(A) $-2^{16} \sim 2^{16}-1$ (B) $-2^{15} \sim 2^{15}-1$
(C) $-2^{15} \sim 2^{15}$ (D) $-2^{16} \sim 2^{16}$
13. 在呼叫一個函數或副程式時，若是直接把真實參數的值指定給正式參數，此種呼叫方式稱為
(A) 傳位址呼叫 (B) 傳名字呼叫 (C) 傳值呼叫 (D) 以上皆非
14. 結構化程式設計的三種基本結構中，下列何者為非
(A) 循序 (B) 選擇 (C) 跳躍 (D) 重複
15. 物件導向程式語言中，將資料和函數一起直接定義在物件上的性質稱做
(A) 封裝(Encapsulation) (B) 階層(Level)
(C) 繼承(Inheritance) (D) 遞迴 (Recursion)

二、解釋名詞（每題 3 分，共 9 分）

1. Random Access Memory (RAM)
2. Virtual Reality (VR)
3. Complex Instruction Set Computer (CISC)

三、問答或計算題（共 61 分）

1. Please find the base 2 and base 4 values equivalent to the base 16 of $(C2F4.EB2)_{16}$. (4 分)

$$(C2F4.EB2)_{16} = (\quad)_2 = (\quad)_4.$$

2. 請利用 C 程式語言定義兩個二維整數陣列如下，利用巢狀 for 迴圈語法，設計一完整程式，以執行陣列加法運算 $C=A+B$ 。(10 分)

$$A = \begin{bmatrix} 4 & 9 & 1 \\ -5 & 3 & 2 \\ -6 & 9 & -10 \end{bmatrix} \quad B = \begin{bmatrix} 8 & -3 & 2 \\ 1 & -4 & 6 \\ 1 & 7 & 19 \end{bmatrix}$$

3. Write down the results of the following programs.

a) (4 分)

```
int main(){
    int i;
    for ( i = 1 ; i < 25; i++ ) {
```

```
        if ( i % 4 == 0 && i > 3 ) {  
            printf("%d\n", i);  
        }  
    }  
    return 0;  
}
```

b) (4 分)

```
#include <stdio.h>  
void f1( int number ){  
    number = number * number ;  
}  
void  
f2( int *nPtr ) {  
    *nPtr = *nPtr + *nPtr ;  
}  
int main( void ) {  
    int number = 2;  
    f1( number );  
    printf( "%d\n", number );  
    f2( &number );  
    printf( "%d\n", number );  
    f1( number );  
    printf( "%d\n", number );  
    f2( &number );  
    printf( "%d\n", number );  
    return 0;  
}
```

c) (5 分)

```
#include <stdio.h>  
int f(int n) {  
    if ( n == 4 ) {  
        return 2;  
    }  
    else {  
        return 2 * f( n + 1 );  
    }  
}
```

```
int main(){
    printf ("ans: %d\n", f(2) );
    return 0;
}
```

4. You can use C, C++, Java, or Python for the following question. (12 分)

Write a program to determine whether it can be a triangle and calculate its area by the given 3 integer values from a file named test.dat. For example, if the content of the input file is 3 4 5, you should output Yes; Area: 6; if the input is 2 2 5, the output will be No.

○Syntax for the function **sqrt()**, which returns the square root of the input:

○**#include <math.h>**

○**double sqrt(double num);**

5. Consider the following program segment where integer n is the input

```
A=2;
for (i=3; i < n; i=i*i*i)
{A=A+1;}
```

i. Find the time complexity (in Θ notation) of this program segment. (4 分)

ii. Express the final value A as a function of n . (4 分)

6. 給定數列 80、25、10、45、20、90、1、30、85、5、15、35、95、50、40，請以「in place 版快速排序法」將它由小排到大，每一回合選擇帶排序的子陣列最左邊那筆資料做為比較基準(Pivot)，且左半子陣列會比右半子陣列先處理，請寫出前面 3 回合時數列的內容。(6 分)

7. A binary tree has 8 nodes. The inorder and postorder traversal of the tree follow: (8分)

Inorder: FECABHDG

Postorder: FECHGDBA

Draw **the binary tree**.