考 試 科 目	計算機概論與程式設計	系 所 別	數位內容碩士學位學程資訊應用組	考 試 時 間	2 月 8 日（六）第 四 節

一、

Multiple Choice Questions (only one correct answer) (40%)

1. Which of the following object is **not** for storing data?

   (A) ROM

   (B) Register

   (C) SSD

   (D) Cache

   (E) None

2. Which of the following number is larger than 76 in decimal?

   (A) 10110100 in 2's complement

   (B) 1000100 in binary

   (C) 4A in Hexadecimal

   (D) 116 in Octal

   (E) None

3. Which of the following expression is True if A: True, B: False and C: False?

   (A) (A AND B) OR C

   (B) (A NAND B) XOR C

   (C) (A NOR B) XOR C

   (D) (A XOR (NOT B)) OR C

   (E) A AND (B OR C)

4. Which of the following sorting method has the **smallest** worst time complexity in Big-O?

   (A) Merge sort

   (B) Quick sort

   (C) Bubble sort

   (D) Selection sort

   (E) Insertion sort

5. Which of the following sorting method has the **largest** worst space complexity in Big-O?

   (A) Merge sort

   (B) Quick sort

   (C) Bubble sort

   (D) Radix sort

   (E) Heap sort

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6. Which of the following statement is **true**? A, B, C are three classes, and B is derived from A.

   (A) A accesses a private variable in B.

   (B) B accesses a protected variable in C.

   (C) A accesses a protected variable in B.

   (D) C accesses a private variable in A.

   (E) B accesses a protected variable in A.

7. In the following statements

   int a = 5;

   int b = 7;

   int c = a * 2 > pow(pow(a, 2) + pow(b, 2), 0.5) && !(a+ ++b < rand()%10 + 3) ? pow(a, 2) % b : pow(b, 2)/ a;

   , which of the following choice is the **correct** answer of **c**?

   (A) 12

   (B) 3

   (C) 4

   (D) 1

   (E) 9

8. In the following statements

   int i = 3, j = 5, k = 0;

   void main(){

     do{

       i = i * j;

       plus(i, j);

       if (2000 < i){

         break;

       }

       k++;

     } while (true);

   }

   void plus(int a, int b){

     a++;

     b++;

     k++;

   }

   which of the following choice is the **correct** answer of **a**?

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(A) 4

(B) 5

(C) 7

(D) 8

(E) 9

9. In bubble sort, how many times the **swap** function is called for an array with the contents {43, 52, 38, 74, 12}?

(A) 4

(B) 5

(C) 6

(D) 7

(E) 8

10. In the following statements
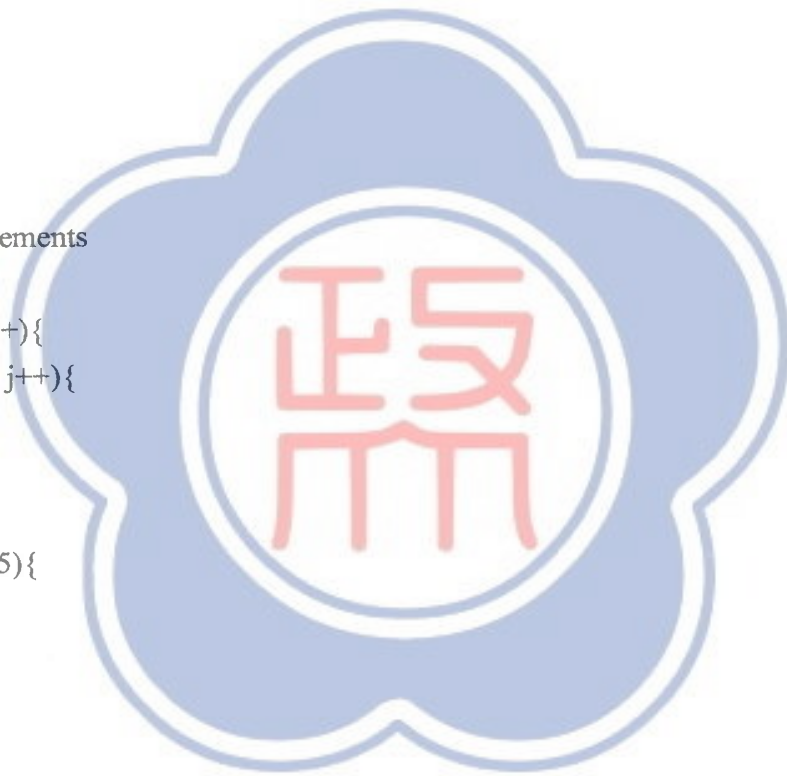
```
int    a = 0;
for (int i = 0; i < 5; i++){
   for (int j = 0; j < 7; j++){
      if (i > 3){
         break;
      }
      if (j > 3 && j < 5){
         continue;
      }
      else if(j > 5){
         break;
      }
      i += a/2;
      j += a%3;
      a++;
   }
}
```

which of the following choice is the **correct** answer of **a**?

(A) 4

(B) 5

(C) 6

(D) 7

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(E) 8

二、

Please answer the following questions. For answers in code, any programming language (but not mixed) or pseudocode is allowed. (60%)

1. Please describe what is object-oriented programming (OOP) (5%), explain the benefits of OOP.(5%), please explain what is constructor (5%) and please write **two** constructors of a class (5%).

2. Please define and declare a function with a nxn 2D integer array as parameter and without return value. The function searches the maximum element of each row and sorts the rows of the array in the ascending order based on the maximum elements of the rows. (20%)
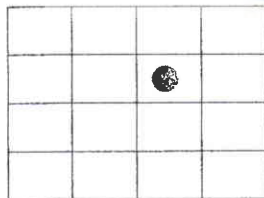
   For example:

   $$\begin{bmatrix} 3 & 22 & 84 \\ 5 & 27 & 14 \\ 33 & 9 & 4 \end{bmatrix} \rightarrow \begin{bmatrix} 5 & 27 & 14 \\ 33 & 9 & 4 \\ 3 & 22 & 84 \end{bmatrix}$$

3. To complete a digital content project, Arduino is a common prototyping tool. Please describe the benefits of Arduino (5%). Please draw a flow chart/architecture diagram with some descriptions and Arduino code, Unity code or pseudocode to show the concept to implement a digital content project. (15%)
   In this project, there is a board with 2D sensor array. When a user pitches a rubber ball to the board (like 棒球九宮格), it detects where the ball hits and a monitor shows where it hits on a grid with red dot.
   (The more complete concept is described, the higher score you get.)

   For example:

   On the monitor

備 註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。