注意事項：

1. 本試題共計二頁。配分標示於各題或各小題。不可使用電子計算機。
2. 作答時可不必抄題，但請務必將各題之完整題號(例：*(1-a)*或*(2-d)*等等)標示清楚。
3. 本試題除各題另有限制之外，可使用 Pseudo Code，Java、C 或 C++作答。

試題：

1. For each of the following statements, indicate TRUE or FALSE. (2 points each, total 16 points)

(1-a) All integer values can be precisely expressed in binary representations.

(1-b) When shifting a binary value right, logic shift and arithmetic shift give the same results.

(1-c) When sorting 100000 data, bubble sort algorithm is more efficient than insertion sort algorithm, shell sort algorithm and heap sort algorithm.

(1-d) The time complexity of searching in n keys using binary search tree is $\Omega(n)$.

(1-e) It is possible that no "#include" directive is used in a C program.

(1-f) The Java Virtual Machine (JVM) is actually the compiler for Java programs.

(1-g) Binary search algorithm can not be used to find the maximum in an array.

(1-h) All digital logic circuits can be implemented using only NAND gates.

2. Choices: For each question below, give the most suitable answer. (3 points each, total 24 points)

(2-a) In comparing the programming languages C and C++, which is correct?
(A) C has longer history and more keywords than C++.
(B) Both C and C++ support object-oriented programming (OOP).
(C) C and C++ support the same data types and use the same operators.
(D) C and C++ have the same syntax rules of *if/else* statement.
(E) C and C++ have the same syntax rules in defining functions.

(2-b) In comparing the programming languages C++ and Visual Basic (VB), which is correct?
(A) VB is suitable to develop window-based applications but C++ is not.
(B) The source programs of C++ and VB must be processed using interpreters.
(C) C++ supports all the data types that VB supports.
(D) C++ supports all the operators that VB supports.
(E) None of the above is correct.

(2-c) What is the output of running the following C program?

```
#define  ABC  2
#define  DEF  5
#define  XYZ  DEF-ABC
#include  <stdio.h>
main( ) { printf("%f\n", ABC*XYZ/DEF); }
```

(A) 1.0 (B) 1.2 (C) 9.6 (D) 10.0 (E) None of (A), (B), (C), (D).

(2-d) What is the output of running the following C program?

```
#include <stdio.h>
main( ) { int  m1=123,  m2=5;  while (m2--) { m1 %= m2; }; printf("%d\n", m1); }
```

(A) 0 (B) 1 (C) 2
(D) No output generated due to compile-time error of the program.
(E) No output generated due to run-time error of the program.

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(2-e) What is the output of running the following C program?

```
#include <stdio.h>
#include <stdlib.h>
main( ) { int  k = 5,  *m,  *a;    m = a = (int *) malloc( k * sizeof(int));
          for ( ; k > 0; k--) *(m+k-1) = 2*k – 1;   printf("%d\n", a[0]+a[2]+a[4]); }
```

(A) No output generated due to compile-time error of the program.
(B) No output generated due to run-time error of the program.
(C) 10 (D) 15 (E) 21 (F) None of (A), (B), (C), (D), (E) is correct.

(2-f) What is the output of running the following C program?

```
#include  <stdio.h>
main( ) { int  x = 1,  y = 2,  z = 3;  printf("%d\n", x & y | z); }
```

(A) 0 (B) 1 (C) 2 (D) 3 (E) None of (A), (B), (C), (D) is correct.

(2-g) Which among the following is not a function of operating system?

(A) Reclaiming memory used by a terminated process (B) Process scheduling
(C) Time and date management (D) Spooling (E) Compiling programs

(2-h) Which of the following is not true for stack?

(A) LIFO (B) Sequential access only (C) Used in call/return of functions
(D) Can be implemented by linked list (E) Used in implementing recursion.

3. Explain the following terms: (3 points each, total 30 points)

(3-a) **Deadlock**	*(3-b)* **html**	*(3-c)* **IP Address**	*(3-d)* **L1 Cache**	*(3-e)* **MP3**
(3-g) **SATA**	*(3-f)* **Multi-core**	*(3-h)* **SOC**	*(3-k)* **UDF**	*(3-m)* **WWW**

4. Suppose that you are assigned to implement a digital logic circuit with binary signals of 10 input signals and 4 output signals. Please answer the following:

(4-a) If it is possible to use a microprocessor or microcontroller, instead of using logic gates such as AND, OR, NAND and so on, for the implementation, then how would you realize it? Please describe your approach to the implementation. (4 points)
(4-b) What are the advantages of your approach in (4-a)? (4 points)
(4-c) What are the disadvantages or limitations of your approach in (4-a)? (4 points)
* If you do not think that it is possible to implement the digital logic circuit using a microprocessor or microcontroller to replace the logic gates, then please give your reason and you might still get the all the points at maximum.

5. A fixed point value x can be expressed as $(A.B)_2 = (C.D)_{10} = (E.F)_{16}$ in which 2, 10, and 16 are the radixes while A, C, E are the integer parts and B, D, F are the fraction parts. A, B, C, D, E, F are all integers. Given that D = 40625 and E = (¼)F, then

(5-a) x = ? (2 points) (5-b) A = ? (4 points) (5-c) B = ? (4 points)

6. The Fibonacci number **Fib(*n*)**, ***n*** is a non-negative integer, is defined recursively as:

$$\textbf{Fib}(n) = \begin{cases} 0 & \text{if } n = 0; \\ 1 & \text{if } n = 1; \\ \textbf{Fib}(n\text{-}1) + \textbf{Fib}(n\text{-}2) & \text{if } n > 1; \end{cases}$$

Please describe a non-recursive algorithm to find **Fib(*m*)** given an integer value ***m***. (8 points)