請照題號依序作答，不可以使用任何計算器。

10% (I) Briefly answer the following questions:
   a. What are the differences between Compiler and Interpreter? (2%)
   b. Explain the differences between cache and buffer. (2%)
   c. Explain the bootstrapping process for a computer. (3%)
   d. Explain the Fetch-Decode-Execute process of a CPU, including how it uses the Program Counter, Instruction Register, Memory, and etc.. (3%)

10% (II) Briefly answer the following questions: (2% for each)
   a. What is parity bit?
   b. What is Error-Correcting Code (ECC)?
   c. Explain the difference between "Packet switching" and "Circuit switching" in computer network?
   d. What is the difference between half-duplex and full-duplex communication mode?
   e. Explain the CSMA/CD protocol for the Ethernet.

10% (III) Briefly answer the following questions: (2% for each)
   a. What is anonymous FTP?
   b. What is HTML? What is XML?
   c. Explain the term "routing" in computer network.
   d. Explain the term "Domain Name System (DNS)" in computer network.
   e. What is the difference between a Layer-2 switch and a Router?

10% (IV) Consider the arrangement of multi-dimensional array in memory:
   a. Give a formula for finding the entry in the i-th row and j-th column if it is stored in row major order. (3%)
   b. As mentioned in (a), what if the array is stored in column major order? (3%)
   c. Suppose that the three-dimensional float array A is to be arranged in row major, and the sizeof(float) is 4 bytes. Each byte occupies one address. The memory location A[1][1][1] is at 2099, A[2][2][2] is 2223, A[4][2][2] is 2415. What is the memory location of A[0][1][1]? List your calculations. (4%)

20% (V) Consider the sorting Algorithms:
   a. What is the time complexity of Selection sort, Insertion sort, bubble sort, and Quick sort respectively? (2%)
   b. "Quick sort" is not a stable sorting algorithm. What does this mean? (2%)
   c. Write the algorithm of bubble sort. (6%)
   d. Write the algorithm for non-recursive Quick sort. (10%, no credit for recursive version!)
10%(VI) Consider the Software Engineering, answer the following questions.
   a. What is OOA? What is OOD? What is OOP? (2%)
   b. Explain the four features of an Object-Oriented Language. (2%)
   c. What is an entity-relationship diagram? Explain it with an example. (2%)
   d. What is CRC card? (2%)
   e. What is UML? What is a "use case"? (2%)

10%(VII) Suppose that IEEE floating standard(IEEE 754/854) is-used to represent
   single precision floating number. (Note that Exponent is excess 127)
   a. What does "IEEE" stand for? (2%)
   b. What is "Big Endian"? What is "Little Endian"? (2%)
   c. Convert the decimal number 1027.3 into binary number. (2%)
   d. Depict the IEEE float 32-bit pattern for the decimal number 1027.3
      In addition to the binary representation, also give its hexadecimal
      representation. (4%)

15%(VIII) Consider the data structures and algorithms:
   a. Draw the binary search tree after inserting 5, 7, 6, 3, 9, 2, 4, 8 into an initially
      empty binary search tree. (2%)
   b. What is an AVL tree? (2%)
   c. Explain "Binary tree representation of tree" with an example? (2%)
   d. What is "Dynamic programming" technique? (2%)
   e. Explain how to implement a STACK using array. Write all the necessary
      functions for all stack operations. You can write a template class using the C++
      Language if you like. (7%)

5%(IX) What is the output of the following C program? Explain your answer.
#include<stdio.h>
double y = 1234567.2;
float x, delta= 0.0001;
int main()
{
    int i;
    x = y;
    printf("Before add, x= %.13f\n", x);
    for(i=1; i<= 8000; i++) x += delta;
    printf("After add, x= %.13f\n", x);
    printf("Before add, y= %.13f\n", y);
    for(i=1; i<= 8000; i++) y += delta;
    printf("After add, y= %.13f\n", y); return 0;
}