*注意：請於答案卷上依序作答，並註明作答之大題及題號。

Part I Multiple choice (單選題) (30%) ※ **本大題請作答於試卷內「選擇題作答區」。**
Instruction: Please select the letter of the most appropriate answer for each question.

1. Which of the following data structure is often used for depth-first search in a tree structure?
   (a) stack (b) queue (c) map (d) set

2. Which of the following technologies is NOT developed due to development of World Wide Web?
   (a) XML (b) HCI (c) Ajax (d) OWL

3. Which technical term is NOT related to Web Service technologies?
   (a) SOAP (b) UDDI (c) HPCI (d) WSDL

4. In symbolic logic, the logic state NOT (*A* OR *B*) is equal to
   (a) *A* AND *B* (b) (NOT *A*) AND *B* (c) (NOT *A*) OR (NOT *B*) (d) (NOT *A*) AND (NOT *B*)

5. The technique whereby the computer system cycles through the active programs, giving each a small processing time slice on each cycle, is called
   (a) multiprogramming (b) time-sharing (c) spooling (d) multiprocessing

6. A display device that uses a separate transistor for each color pixel is a(n)
   (a) dual-scan display (b) passive-matrix display (c) active-matrix display (d) dynamic display

7. The binary number 11011001 is equivalent to the decimal number
   (a) 217 (b) 169 (c) 179 (d) 189

8. The object-oriented programming language does NOT necessarily support
   (a) inheritance (b) polymorphism (c) encapsulation (d) persistence

9. Which type of the following engineering reasoning does not require a closed-world hypothesis?
   (a) induction (b) abduction (c) deduction (d) none of the above

10. Which one of the following engineering tasks is of deduction type?
    (a) analysis (b) design (c) diagnosis (d) interpretation of information

Part II Question and Answer (簡答題) (40%)
Instruction: Write brief but complete answer for each of the following questions

1. What are the computer and information technologies involved in the car navigation system (汽車導航系統)? Please briefly explain ONE of the possible mechanisms used for car navigation systems and list ALL the major hardware and software technologies needed with explanation on the role each technology plays (or functions it provides) in the system. **(10%)**

2. Please briefly explain why the database technology can provide the following advantages **(8%)**:
   a. Reduction of data redundancy (重複性)
   b. Increase of data integrity (一致性)
   c. Increase of data sharing (分享性) and accessibility (可及性)
   d. Reduction of development time for database application software

3. Please briefly explain the concept of pointer in computer programming. Also, please explain how the pointer concept can be realized when we use a computer programming language that does not have a direct support for pointers. **(10%)**

4. Please describe the logical steps in combining the contents of two already sorted (ascending order 由小至大) integer lists (each has N integers) into a single integer list (also in ascending order). **(12%)**

見背面

Part III Programming (程式題) (30%)

Instruction: You should write the program using one of the following programming languages: Fortran, C, C++, C#, or Java. Code comments are necessary if the statement is not straightforward. The computational efficiency, exception handling, and programming style will be considered in grading.

1.　Assume a 100 x 100 painting paper is presented by an *x-y* coordinate system in which $0.0 \leq x, y \leq 100.0$. Please write the following functions to draw shapes on the paper:

(A) *drawRectangle(x1, y1, x2, y2)* that draws a rectangle with the lower-left corner at point (*x1, y1*) and the upper-right corner at point (*x2, y2*). **(10%)**

(B) *drawCircle(x, y, r, n)* that draws a circle with its center located at point (*x, y*) and a radius of *r*. The integer *n* is the total number of line segments used to draw the circle. **(10%)**

(C) *drawOctagon (x, y, L)* that uses *drawCircle(x, y, r, n)* to draw a regular Octagon (正八邊形) with its center located at point (*x, y*) and side length of *L*. **(10%)**

The following two functions are provided for controlling the drawing pen:
- *MoveTo(x, y)*: Move the drawing pen from the current position to point (*x, y*) without drawing a line on the paper.
- *DrawTo(x, y)*: Draw a line from the current position to point (*x, y*).

The following mathematic functions are also provided:
- *cos(angle)*: Assign the angle in <u>degrees</u> and the function will return a cosine value.
- *sin(angle)*: Assign the angle in <u>degrees</u> and the functions will return a sine value.

It should be noted that the pen should not draw outside the range of the paper.