【單選題，每題 2 分，共 50 分。】

1. The ＿＿＿＿＿＿＿ creates object code and stores it on disk.
   - a. Linker.
   - b. Compiler.
   - c. Preprocessor.
   - d. Loader.

2. The linker links:
   - a. The source code with the object code
   - b. The object code with the external libraries
   - c. The executable code with primary memory
   - d. The primary memory with the CPU

3. Converting from type ＿＿＿＿＿＿ to type ＿＿＿＿＿＿ will result in the loss of data.
   - a. bool, char.
   - b. float, double.
   - c. int, char.
   - d. short, long.

4. Each standard library has a corresponding:
   - a. Function.
   - b. Variable type.
   - c. Header file.
   - d. Cd-rom.

5. Which of the following statement is **False**?
   - a. An array is a random-access structure.
   - b. A sequential list is a random-access structure.
   - c. A linked list is a random-access structure.
   - d. A stack is not a random-access structure.
   - e. None of the above

6. Which of the following statement is **True**?
   Recursive functions :
   - a. often have fewer local variables than the equivalent nonrecursive routines.
   - b. generally use *while* or *for* statements as their main control structure.
   - c. are possible only in languages with static storage allocation
   - d. should be used whenever execution speed is critical.

7. Which of the formulas gives the maximum number of nodes in the Nth level of a binary tree?
   - a. $N^2 - 1$
   - b. 2^N
   - c. $2^{N+1} - 1$
   - d. 2^{N+1}
   - e. None of the above

8. What value does function mystery return when called with a value of 4?

```
int mystery ( int number )
{
    if ( number <= 1 )
        return 1;
    else
        return number * mystery( number – 1 );
}
```
   - a. 0.
   - b. 1.
   - c. 4.
   - d. 24.

注意：背面有試題

9. Recursion is memory-intensive because:
   a. Recursive functions tend to declare many local variables.
   b. Previous function calls are still open when the function calls itself and the activation records of these previous calls still occupy space on the call stack.
   c. Many copies of the function code are created.
   d. It requires large data values.

10. All of the following are reasons to use recursion except:
   a. An iterative solution is not apparent.
   b. The resulting program is easier to debug.
   c. It more naturally mirrors the problem.
   d. It maximizes execution performance.

11. Given that k is an integer array starting at location 2000, kPtr is a pointer to k and each integer is stored in 4 bytes of memory, what location does kPtr + 3 point to?
   a. 2003.
   b. 2006.
   c. 2012.
   d. 2024.

12. Every object of the same class:
   a. Gets a copy of every member function and member variable.
   b. Gets a copy of every member variable.
   c. Gets a copy of every member function.
   d. Shares pointers to all member variables and member functions.

13. Which of the following is not true of object-oriented design?
   a. OOD takes advantage of inheritance relationships.
   b. OOD encapsulates attributes and operations into objects.
   c. OOD focuses on actions (verbs).
   d. Each class can be used to create multiple objects.

14. Select the false statement regarding inheritance.
   a. A derived class can contain more attributes and behaviors than its base class.
   b. A derived class can be the base class for other derived classes.
   c. Some derived classes can have multiple base classes.
   d. Base classes are usually more specific than derived classes.

15. Polymorphism is implemented via:
   a. Member functions.
   b. virtual functions and dynamic binding.
   c. inline functions.
   d. Non-virtual functions.

16. Abstract classes:
   a. Contain at most one pure virtual function.
   b. Can have objects instantiated from them if the proper permissions are set.
   c. Cannot have abstract derived classes.
   d. Are defined, but the programmer never intends to instantiate any objects from them.

17. The main difference between a pure virtual function and a virtual function is:
   a. The return type.
   b. The member access specifier.
   c. That a pure virtual function cannot have an implementation.
   d. The location in the class.

注意：背面有試題

18. Assuming that all four of the following functions are defined, which one will be called by the function call square(23.4)?
    a. template< typename T >
       T square(T num).
    b. template< typename T1, typename T2 >
       T1 square(T1 num1, T2 num2).
    c. int square(int num).
    d. double square(double num).

19. An algorithm that requires _____ operations to complete its task on n data elements is said to have a linear runtime.
    a. $n^3 + 9$.
    b. $3 n^2 + 3 n + 2$.
    c. $2 n + 1$.
    d. 6.

20. Which of the following is not a dynamic data structure?
    a. Linked list.
    b. Stack.
    c. Array.
    d. Binary tree.

21. _____ is not an advantage of linked lists when compared to arrays.
    a. Dynamic memory allocation.
    b. Efficient insertion and deletion.
    c. Direct access to any list element.
    d. No need to allocate extra space, "just in case."

22. A stack is initially empty, then the following commands are performed:

    push 5
    push 7
    pop
    push 10
    push 5
    pop

Which of the following is the correct stack after those commands (assume the top of the stack is on the *left*)?
    a. 5 10 7 5.
    b. 5 10.
    c. 7 5.
    d. 10 5.

23. In general, which of the following contains the most amount of data?
    a. A database.
    b. A file.
    c. A byte.
    d. A field.

24. Given that the line

    delete newPtr;

just executed, what can you conclude?
    a. The memory referenced by newPtr is released only if it is needed by the system.
    b. The pointer newPtr is of type void *.
    c. The pointer newPtr only exists if there was an error freeing the memory.
    d. The pointer newPtr still exists.

25. Two structure variables of the same type with the same member values, when compared will:
    a. Always compare equally.
    b. Never compare equally.
    c. Sometimes compare equally.
    d. Result in a compile error.

注意：背面有試題

【非選擇題，共 50 分】

26. Please explain the following memory management techniques. 請解釋下列的記憶體管理方法：
   - Paging   (5%)
   - Demand Segmentation   (5%)
   - Monoprogramming   (5%)
   - Virtual Memory   (5%)

27. What is the binary representation of $(12.75)_{10}$ in IEEE single precision floating point format? Notice that Sign=1 bit, Exponent=8 bits in Excess_127, and Mantissa=23 bits. (8%)

28. A computer uses 2's complement to represent a negative integer. Let X and Y be two 8-bit signed integers in the computer, where

        X= 0011 0011　　　and　　　Y= 0110 1111
   Then X-Y=?　 Show details of how you calculate it. (7%)

```
class Cell {
  public:
  Cell(int v) {value=v;}
  void set(int v) {value=v;}
  int get() {return value;}
  private:
    int value;
};


Cell& multiply(Cell *a, Cell *b) {   ...   }
```
Figure 1. The definition of class *Cell* and the format of function *multiply* in C++.

29. Consider the C++ program in Figure. 1. Use class Cell to design a global function multiply which multiplies the values of Cell *a and Cell *b, and returns a reference to a new Cell object that has the result.   (10%)
   請參考 Figure. 1，使用 class Cell 去設計一個函式 multiply 去計算 Cell* a 和 Cell* b 所指向的內容的 value 的乘積，然後回傳一個含有這個計算結果的新 Cell 物件。

```
...
int main() {
   int i =0, sum=0;
   for (int j = 0; j < 100; j++) {
      while (i <= 5) {
         i++;
         if (i==2) {continue;}
         if (i==4) {break;}
         sum=sum+i;
      }
   }
   printf("%d\n",sum);
   return 0;
}
```
Figure 2. A loop-control program in C.

30. What is the result of executing the C program in Figure 2? Please show details of how the program works. (5%)
   執行 Figure 2 的程式後會產生什麼結果？請列出該程式計算過程的轉節。