I. Choice questions (單選): (50%)

_____ 1. Which of the following is not related to the wireless communication?
   a. AMPS         b. GSM         c. Bluetooth     d. BSD

_____ 2. About IP address, which of the following is correct?
   a. It contains 4 numbers which is made up of 32 bytes
   b. The IP address is classified as A~E classes.
   c. Each bit in IP address defines 0~255 address
   d. none of the above

_____ 3. Which of the following is correct for the Unix environment?
   a. Unix is a Multi-user system
   b. Unix contains three types of files, i.e., regular file, directory, and special file.
   c. The command “cp -r A B” will copy the file and the subdirectory under directory A to directory B.
   d. all of the above

_____ 4. Which of the following is correct?
   a. An Archie server helps locating the file(s) among the internet
   b. An ftp server helps locating the files among the internet
   c. The “telnet” command will connect to a BBS server for loading data
   d. all of the above

_____ 5. The 6-bit Gray Code 101101 is equal to the decimal number of
   a. 45         b. 61         c. 54         d. none of the above

_____ 6. Which of the following is not correct?
   a. VOD means Voice of Device
   b. The access speed of SRAM is faster than DRAM
   c. GPS is one of the most popular wireless communication systems
   d. MPEG is the major compression technique for static image.

_____ 7. Simplify the Boolean function:
   \[ F(A,B,C,D) = \sum(2,3,5,6,7,8,10,12,13,14) \]
   a. \( A'C' + BC'D + AD' \)         b. \( A'BC + ABC' + A'C' + A'D \)
8. Which of the following language is not Object-Oriented:
   a. JAVA      b. C++       c. BASIC       d. SmallTalk

9. When we perform Hash Search, the collision may happen when
   applying hashing function. Which of the following method is not used
   for detecting hash collision problem:
   a. linear probing       b. quadratic probing
   c. random method        d. token detection

10. Which of the following about SQL and its language is correct?
   a. SQL is a procedural language.
   b. SQL is not a standard language yet for RDBMS.
   c. "CREATE VIEW ABC as SELECT....." This command will create
      a view table which will exists (stored) in the physical disk.
   d. none of the above

11. About C language, which of the following can be an enumeration
     constant?
     a. an identifier   b. a string  c. an integer  d. all of the above

12. About C language, which of the following statements is true?
     a. Structures cannot have two fields of the same type.
     b. Structures must have at least two fields.
     c. A field in a structure cannot itself be a structure.
     d. Every variable of a given structure type has its own copy of the data fields
         defined in the structure.

13. About C language, which of the following statements is wrong?
     a. Symbols at the top level, outside of all functions, are extern by default,
        while symbols defined within a function are auto by default.
     b. Symbols declared as register are different from auto symbols because
        register symbols are allocated at high-speed memory inside the central
        processor and thus could be applied to the global variables and parameters.
     c. Symbols declared as extern can be shared by multiple code modules, while
        static symbols are private within the module that defines them
d. Symbols declared as static are allocated and initialized once, when the program is loaded, while auto symbols are allocated and initialized each time control enters the scope that defines them.

14. Which is true according to the following program fragment using a macro call.

```c
#define SQUARE(n) n * n

double x = 0.5, y = 2.0;
int n = 4, m = 12;
printf("%.2f + %.2f)squared = %.2f\n\n", x, y, SQUARE(x + y));
printf("%.d squared divided by\n", m);
printf("%.d squared is %.d\n", n, SQUARE(m) / SQUARE(n));
```

a. Because macros are handled through substitution, the compiler requires the same memory as the same program using a function.

b. The above macro can also be extended in two lines as the following

```c
#define SQUARE(n) /
    n * n
```

c. The result of the first printf is \((0.5 + 2.0)\) squared = 6.25

d. The result of the third printf is 4 squared is 144

15. Which of the following statements is not the advantage by using dynamic memory allocation (instead of arrays) for data structures?

a. they grow and shrink for saving execution time.

b. they make better memory utilization.

c. they are appropriate for the unpredictable number of data elements.

d. all of the above

16. Which of the following softwares will be notified when the keyword `extern` is used in a declaration?

a. compiler    b. linker    c. compiler as well as linker    d. none of the above

17. The sorting time in worst case of heap sort is

a. \(O(n \log n)\)    b. \(O(n)\)    c. \(O(\log n)\)    d. \(O(n \log \log n)\)
18. Which data structure is always used in the CPU scheduling in the operation system.
   a. Stack  b. Queue  c. Binary Tree  d. B-tree

19. If you need to build a data structure for read only application, what operation may not be needed.
   a. sorting  b. add an item  c. find the maximum  d. string matching

20. Which kind of data structure is always used to solve the shortest-path problem?
   a. stack  b. B-tree  c. Graph  d. Hash table

II. Answer the following questions: (50%)

1. From 1960 to today, there are new technologies for keeping our computer better and better. In order to face our new technology world, we need to review the history of computer hardware and software so that we will understand the trend for the future.
   a. Please briefly write down (itemize) the history of computer hardware and computer software.
   b. Please find out what is the trend of computer hardware and computer software based on those characteristics that you know.
   c. Please use our daily life and our business work for example to discuss and predict the future environment that may affect by the new computer technologies.

2. State whether the following code fragments are legal or illegal. For the illegal ones, say why.
   a. char fred [] [6] = {"Hi", "there"};
   b. char fred [] [] = {"Hi", "there"};
   c. char fred [2] [6] = {"Hi", "there"};
   d. char fred [2] [] = {"Hi", "there"};
   e. int x[6];  x[6]=2;
3. Let a linked list contain three nodes with values “him”, “her”, and “its”, and hp be a pointer to the list head. Assume the data component of node type pro_node_t is pronoun, the link component is nextp, and np and mp are pointer variables.

   What is the effect of the following statements?
   ```
   np = hp->nextp;
   strcpy(np->pronoun, “she”);
   ```

   What is the effect of the following code fragment?
   ```
   mp = hp->nextp;
   np = mp->nextp;
   mp->nextp = np->nextp;
   free(np);
   ```

   What is the effect of the following code fragment?
   ```
   np = hp;
   hp = (pro_node_t *) malloc( sizeof (pro_node_t) );
   strcpy(np->pronoun, “his”);
   hp->nextp = np;
   ```

4. Write a data structure to represent the friendships in a group. And then, implement the following operations.
   a. find(t): find all the friends of person t.
   b. The best friend: find the one who wins maximum friendship

5. Describe the following terminology.
   a. Object Oriented Programming
   b. Client-Server Architecture
   c. CPU scheduling
   d. Linker
   e. MPEG compression