[1] Multiple Choice : (60%)

1. Consider two variables in C language, int x, *p;  Assume the address of x is located at FF01. What is the result of (*p)++;  if x=5 and p=&x ?
   (A) FF01  (B) FF02  (C) 6  (D) 5  (E) None of the above

2. What is the execution result of the postfix expression 6 2 3 + - 3 8 2 / + * ?
   (A) 7  (B) 6  (C) 5  (D) 37  (E) None of the above

3. Which of the following is not a correct postfix expression?
   (A) AB+C*  (B) ABC+*  (C) AB+C*  (D) ABC*+  (E) None of the above

4. A structure in C language is defined as in Figure 1. Which of the following contains address
   (A) classlist[2]
   (B) classlist[2].gpa
   (C) classlist[6].class,
   (D) classlist[8].name
   (E) All of the above

5. How many comparisons are needed if we want to find element 13 in the sorted data list {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20} using binary search?
   (A) 13  (B) 4  (C) 3  (D) 14  (E) None of the above

6. Given a function \( f(n) = \frac{4n^3 + 2n^2 - 8}{n-3} + 3n - 2 \), what is the order of this function?
   (A) \( n^3 \)  (B) \( n^2 \)  (C) \( n \)  (D) \( n \cdot \log n \)  (E) None of the above

7. A complete binary tree of depth 5 contains how many nodes?
   (A) 63  (B) 64  (C) 31  (D) 32  (E) None of the above

8. Which of the following recursive problem cannot be directly solved using iteration method?
   (A) Factorial  (B) Multiplication of natural numbers  (C) Fibonacci sequence
   (D) Tower of Hanoi  (E) All of the Above
9. Which software is designed for user to work (edit) easily with bitmap images?
   (A) Acrobat    (B) CorelDraw    (C) Photoshop
   (D) Illustrator (E) All of the above

10. Which of the following issue should be solved as quickly as possible in cyberspace?
    (A) People cannot communicate directly with each other
    (B) Existing laws do not cover many situations that arise
    (C) It's too slow to send binary files from one site to another
    (D) There are too many sharewares and freewares that makes users too difficult to choose.
    (E) All of the above

11. Data compression is necessary
    (A) for all multimedia programs
    (B) for faster data transmission
    (C) for all animation programs
    (D) to avoid conflict between simultaneous transmissions
    (E) All of the above

12. Which of the following system design approach allows customer to see and experiment a system before fully developed?
    (A) Object-Oriented design
    (B) Entity-Relationship design
    (C) Structured design
    (D) Prototyping design
    (E) None of the above

13. When running a program, which term holds a specific value in memory until a value is changed?
    (A) An object
    (B) A link
    (C) A variable
    (D) An instruction set
    (E) All of the above

14. Which of the following is not correct for XML?
    (A) It stands for eXtensible Markup Language
    (B) It's an open standard
    (C) It does not limited to certain platform
    (D) It does not support the developing of EDI
    (E) It is easy to develop user agent (crawler)

15. When we implement a stack with an array of fixed size, which stack operation should take care overflow problem?
    (A) push    (B) pop    (C) top of stack    (D) empty of stack    (E) None of the above
16. Assume quick sort method for sorting list \{Eddy, Allen, Car, Mom, Man\} is used. Which list is the result after first-round sorting process?
   (A) Allen, Eddy, Mom, Man, Car       (B) Mom, Eddy, Allen, Car, Man
   (C) Car, Eddy, Allen, Man, Mom       (D) Car, Eddy, Mom, Allen, Man   (E) None of the above

17. Let a computer uses 128K main memory. What is the minimum size for memory addressing register?
   (A) 18 bits       (B) 17 bits       (C) 17bytes       (D) 129 bits       (E) 18 bytes

18. Which component is not part of the expert system?
   (A) Search Engine       (B) Inference Engine
   (C) Interpretation subsystem   (D) Robotic System       (E) Natural language interface

19. Which of the following is not correct for creating deadlock?
   (A) preemption condition       (B) partial allocation
   (C) mutual exclusive       (D) circular wait condition   (E) None of the above

20. Which of the following is correct?
   (A) ASCII is a 7-bit universal standard code and used in PC only.
   (B) EBCDIC is a 8-bit code used in PC machine only
   (C) Unicode is a 16-bits universal standard code
   (D) Big-5 is a 2-word input code that is used for input Chinese character
   (E) None of the above

21. Which language/software does not support object-orient programming and design?
   (A) Delphi       (B) Java       (C) VB       (D) Power Builder       (E) None of the above

22. Which process can not eliminating data redundancy when designing a database?
   (A) remove those data fields that depend on primary key
   (B) remove partially dependency after 2NF
   (C) remove those schemas that contains redundant information
   (D) remove those un-normalized information after 1NF
   (E) all of the above

23. Electronic commerce, if design well, is better than the traditional commerce for handling
   (A) the process of QR       (B) the process of CRM
   (C) the process of B-to-B     (D) the process of EDI       (E) all of the above
24. In SDLC(system development life cycle), which period is found cost more money than the other period?
(A) The routine maintenance period   (B) The analysis, designing, and developing period
(C) The review period                (D) The coding period
(E) None of the above

25. Which of the following Unix command explanation is correct?
(A) vi: check the software version number   (B) rm: remove a tree
(C) mkdir: create a directory             (D) pwd: changing password
(E) Is: listing all the file names and file size

26. Which of the following is not correct?
(A) A multi-tier design is necessary for intranet
(B) The (DFD) Data Flow Diagram can be used for both system analysis and design.
(C) Using CASE tool can help speeding up system analysis and design
(D) DES is stands for Data Encryption Standard
(E) All of the above

27. Which of the following is not a data link application?
(A) X.25  (B) ISDN  (C) packet switching  (D) TCP/IP  (E) frame relay

28. **Figure-2** is a program that uses "Call by Address " for parameter passing. What is the result of A after program is executed?
(A) 1  (B) 6
(C) 8  (D) 2  (E) None of the above

29. When collision, which of the following is not a re-hashing technique?
(A) Refreshing
(B) Randomly probing
(C) Take quadratic value
(D) Add the link for overflow data
(E) Find the next free space

30. Which type of file cannot be affected by virus?
(A) Spreadsheet file   (B) Plain text file
(C) Execution file     (D) Macro file
(E) All of the above
[2] Programming and Data Structure design  (40%)

(You are suggested to use C or any high level language for designing the algorithm. Assumptions are allowed if the question does not give enough information.)

1. (10%) Please use the concept of stack to write a "reverse()" function. This reverse function can reverse a string.
   For example, when input: abcd e, the reverse() function will generate: edcba (or print out: e d c b a).

2. (15%) Assume we have 10,000 records and each record contains two data fields, i.e., name (10 bytes) and student number (7 bytes).
   (a) please design a database with efficient accessing technique and structure.
   (b) please write down an algorithm that allows user to use student number as the key to query the related name.

3. (15%) It is proved that use the "right hand rule" (put your right hand on the wall and walk along with it) can help you get out of the maze(迷宫). Assume we already have five library functions:

   forward(): this function can move your position forward
   turn-left(): this function can turn your position to the left
   turn-right(): this function can turn your position to the right
   if-facing-wall(): this function can detect if the current position is facing the wall
   if-out(): this function can detect if your are at the "exit" of maze (i.e., out of the maze)

Please utilize these libraries to design an algorithm (function) to solve the "maze problem," i.e., your algorithm should be able to lead you from the "entrance" of the maze to get out of the maze.