一、選擇題(單選題, 每題二分) 50%：〔※請依題號順序答於答案卷上〕

1. A personal computer (PC), also called a(n) _____, is a small system designed to be used by one person at a time.
   a. minicomputer
   b. microcomputer
   c. mainframe computer
   d. supercomputer

2. The _____ page is the first page of information at each Web site.
   a. starting
   b. desktop
   c. home
   d. source

3. ROM memory is described as nonvolatile because _____.
   a. it can be altered but cannot be read or used
   b. data and programs can be transferred into and out of ROM
   c. its contents are erased when the power is turned off
   d. it retains its contents even when the power is turned off

4. _____ require special software that can recognize how to divide up problems and bring the results back together again.
   a. Parallel processors
   b. Coprocessors
   c. Microprocessors
   d. Pipeline processors

5. Newer microprocessors have some cache memory, called _____, built into the microprocessor chip itself.
   a. cache 1 (C1)
   b. level 1 (L1) or internal cache
   c. cache 2 (C2)
   d. level 2 (L2) or internal cache

6. The term _____ is used to describe the condition of a disk drive that has many files stored in noncontiguous clusters.
   a. fragmented
   b. striped
   c. partitioned
   d. shattered

7. For personal computers, IDE and SCSI are two common _____.
   a. direct access storage controllers
   b. disk cartridges
   c. floppy disk controllers
   d. hard disk controllers

8. A(n) _____ is a computer system that maintains a centralized collection of information in the form of electronic messages.
   a. network operating system (NOS)
   b. global positioning system (GPS)
   c. electronic data interchange (EDI)
   d. bulletin board system (BBS)

9. For telephone lines to carry digital signals, a special piece of equipment called a _____ is used to convert between digital signals and analog signals.
   a. gateway
   b. router
   c. modem
   d. bridge

10. The Internet is a term used to describe _____.
    a. a worldwide group of connected networks that allow public access to information and services.
    b. two or more networks that are joined together
    c. a network that originally was operated by the National Science Foundation
    d. a local network that can be owned by a private or public organization

11. Hypertext and hypermedia allow learning in a nonlinear way, meaning that _____.
    a. topics are learned as they are presented, from beginning to end
    b. it is possible to branch off and investigate related topics as they are encountered
    c. data is displayed in arcs, curves, and circles around the screen
    d. information is offered without regard to limiting geometric concepts

12. A(n) _____ is a combination of a user name and the domain name that identifies the location of the mailbox computer.
    a. Uniform Resource Locator
    b. Internet protocol address
    c. Internet mailbox address
    d. Internet service provider

13. _____ operating systems used on personal computers usually support a single user running multiple programs at one time.
    a. Single tasking
    b. Multiprocessor
    c. Virtual machine
    d. Multitasking

14. Which of the following is *not* one of the unique features of Windows NT? ____
    a. support for most major networking communications protocols
    b. requires less disk space, memory, and slower processors
    c. preemptive multitasking and multithreading
    d. system performance measurement

15. All of the following are major aspects of data management *except* _____.
    a. data accuracy
    b. data security
    c. data moderation
    d. data maintenance

16. Database systems offer easier reporting than file-oriented systems because _____.
    a. duplicate data is increased greatly in a database system
    b. different levels of security can be established over information in the database
    c. development of programs takes less time and often is easier
    d. data can be retrieved from multiple sources at one time

17. The _____ database structure is the most recently developed and takes advantage of large-capacity, direct-access storage devices.
    a. relational
    b. hierarchical
    c. network
    d. object-oriented

18. Some examples of a(n) _____ are billing systems, inventory control systems, accounts payable systems, and order entry systems.
    a. transaction processing system (TPS)
    b. executive information system (EIS)
    c. management information system (MIS)
    d. decision support system (DSS)

19. If a structured walkthrough is successful and a project deemed feasible, what is the next phase in the system development life cycle (SDLC)? ____
    a. design
    b. implementation
    c. support
    d. analysis

20. Code that never is executed in a program is called _____.
    a. dead code
    b. spaghetti code
    c. pseudocode
    d. object code

21. Also called structured flowcharts, _____ are design tools used to graphically show the logic in a solution algorithm.
    a. program flowcharts
    b. Nassi-Schneiderman (N-S) charts
    c. pseudocodes
    d. subroutines

22. A person who tries to break into a computer system is called a _____.
    a. cracker
    b. hacker
    c. cookie
    d. both a and b

23 In the encryption process, the readable data is called _____.
    a. data encryption standard (DES)
    b. plaintext
    c. ciphertext
    d. encryption key

24. A computer system that uses specific hardware and software components to input, process, and output various types of media is called a(n) _____.
    a. information kiosk
    b. multimedia personal computer
    c. sound card
    d. electronic magazine

25. _____ are graphical objects in the ToolBook package that contain properties that give them a special behavior.
    a. Buttons
    b. Fields
    c. Widgets
    d. Icons

二、問答題 50%：

1. Given the logic function $F = A'B' + A'C' + C'D' + B'CD$
   (a) Use the Karnaugh map to find the maxterm expansion of F (express your answer in both decimal and alphabetic notation). *4%*
   (b) Use the Karnaugh map to find the minimum sum-of-products form for F'. *3%*
   (c) Find the minimum product-of-sums for F. *3%*

2. Consider the following railroad switching network :
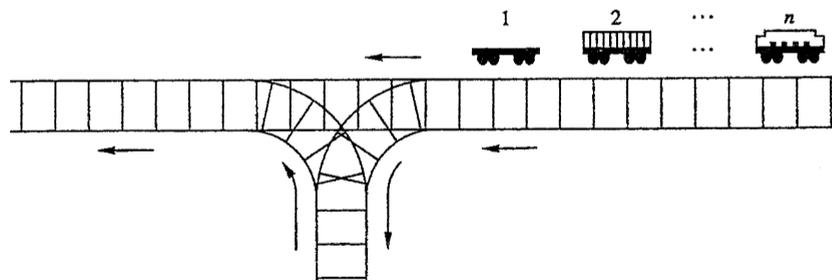
Railroad cars numbered 1, 2, ..., n on the right track are to be permuted and moved along on the left track. A car may be moved directly onto the left track, or it may be shunted onto the siding to be removed at a later time and placed on the left track. The siding thus operates like a stack, a push operation moving a car from the right track onto the siding and a pop operation moving the "top" car from the siding onto the left track.
   (a) For n = 4, find all possible permutations of cars that can be obtained(on the left track) by a sequence of these operations. Are any permutations not possible ? *4%*
   (b) In general, what permutations of the sequence 1, 2, ..., n can be obtained when a stack is used in this manner. *4%*
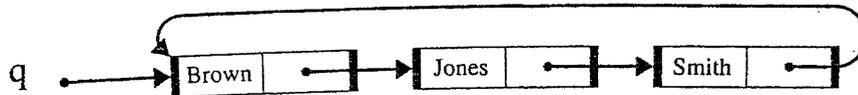
3. Consider the queue data structure based on circular linked list implementation. An example is shown below :

   (a) In the above diagram, indicate which node is the front node(containing the first item) and which node is the rear node (containing the last item). Remember that queue insert and delete operation should be done in constant time (i.e. independent of queue length). *2%*

   (b) Redraw the diagram after insert node 5 and then delete a node. *2%*

   (c) Complete the C function which finds and returns the length of a given queue. *4%*

```
typedef struct node { int item ; struct node *next ;} Node ;
typedef Node *queue ;
int queue_length(queue q) /* return the number of items in queue q */
{ /* write the function body ! */ }
```

4. (a) Draw the binary search tree that results when the numbers 50,70,90,20,40,80,30 are inserted into an initially empty binary search tree in the given order. *3%*

   (b) Write a recursive C function which finds and returns the minimal value stored in a given nonempty binary search tree. *3%*

```
typedef struct node { int info; struct node *left, *right; } Node;
typedef Node *bstree ;
int find-min (bstree t )  /* t is nonempty */
{ /* Write the function body ! */ }
```

   (c) Write the **find-min** function in nonrecursive form. *3%*

   (d) What is the best-case, worst-case, average-case timing function of the **find-min** function. *3%*

   (e) A fully-threaded binary search tree replaces not only NULL right links with threads to inorder successors, but also NULL left links with threads to inorder predecessors. Show the fully-threaded binary search tree of (a). *3%*

   (f) Suppose we want to write functions, using neither recursion nor stacks, to traverse a fully-threaded binary search tree in preorder, inorder, and postorder manner, (i)are any function(s) impossible to write? (ii)which one is more (or the most) difficult to write? *3%*

5. For the integer array X with elements X[1..8] = {99,88,55,77,22,33,44,66}, show how the elements of X are rearranged step by step if we apply the statement to heapify X: *6%*

```
for ( n = 8 / 2 ; n > 0 ; n--) shiftdown(X,n,8);
/* elements in X[1],X[2], … ,X[8], shiftdown function is given below */

void shiftdown ( int *a, unsigned int r, unsigned int n)
 /* this function accepts an almost complete binary tree stored in */
 /* positions r .. n of array a with left and right subtrees that are */
 /*heaps and then converts the tree to a heap */
{ unsigned int son ;
  int temp;
  for ( temp = a[r] ; r * 2 <= n ; r = son ) {
      son = r * 2 ;
      if ( ( son != n ) && ( a[son+1] > a[son] ) ) son++ ;
      if ( temp < a[son] ) a[r] = a[son] ; else break ;
  }
  a[r] = temp ;
}
```