I. Multiple choice (40%):

1. In ASCII, the code for "A" is 1000001. What is the ASCII code for "E" ?
   A) 1000101　B) 1000100　C) 1000010　D) 1000011

2. What does the Megahertz (MHz) speed of a processor refer to?
   A) the memory size　B) the processor type　C) the bandwidth　D) the internal clock

3. Which of the following affect the quality of a computer monitor's output?
   A) interlaced vs. non-interlaced　B) the size of the dot pitch　C) both a and b　D) none of these

4. A computer field which attempts to make computers more "intuitive" like humans by analyzing logical relationships which are more or less true, in contrast to ordinary logic where relations are more precise, is called:
   A) fuzzy logic　B) hyperlogic　C) symbolic logic　D) binary logic

5. What term describes the design and layout of the electronic components of a computer system?
   A) central electronic complex　B) motherboard　C) central processing unit　D) computer architecture

6. One measure of the relative speed of machines which calculates the average number of instructions per second is:
   A) ASCII　B) MIPS　C) megahertz　D) microseconds

7. What is the hexadecimal equivalent of the binary number 10101011?
   A) BA　B) AB　C) 9C　D) C9

8. Dividing an output screen into a grid of individual pixels is called:
   A) bit mapping　B) CRT maps　C) character mapping　D) video display technology

9. When a program is running in a personal computer, where is its active binary representation physically located?
   A) in primary storage　B) on a diskette　C) in the BIOS　D) under the keyboard

10. Which of the following is not one of the desirable characteristics of RAM chip memory?
    A) small size for large capacity　B) quick access to information　C) cannot be overwritten　D) reliability

11. Data on floppy diskettes are recorded on a series of concentric, circular:
    A) sectors　B) tracks　C) bytes　D) holes

12. All of the following are considered useful in structured program design except:
    A) sequence　B) goto　C) selection　D) iteration (looping)

13. What determines how quickly binary instructions are retrieved from memory and processed?
    A) the programming language　B) the compiler　C) the internal clock speed　D) all of these

14. Assembly language is:
    A) an advance over machine language, with symbolic instructions and addresses
    B) the only language the computer hardware understands
    C) assembled and disassembled while it is executed
    D) what most programmers use today in writing programs

15. Program instructions written in high-level language are checked and translated into machine language by the:
    A) text editor　B) object module　C) compiler or interpreter　D) programmer

16. What software distribution method allows users a free trial of the software so that only those who want to keep it must pay?
    A) freeware　B) software licensing　C) shareware　D) none of these

17. Which of the following is not a feature of spreadsheets?
    A) charts and graphs for data presentation　B) cut and paste　C) what-if scenarios　D) querying a data file

18. Which of the following is not a Boolean operation?
    A) intersection　B) OR　C) complement　D) less than

19. The relationship between fields, records, and files is as follows:
    A) fields comprise records which, in turn, comprise the file　　C) records comprise fields which, in turn, comprise files
    B) files comprise records which, in turn, comprise fields　　D) fields comprise files which, in turn, comprise records

20. A consistency check is software added to a database management system to monitor:
    A) data integrity　B) data security　C) data access　D) data users

21. Which of the following is an essential element of raster graphic technology?
    A) frame buffer　B) graphics processor　C) sweeper　D) all of these

22. Today dot-matrix, ink-jet, and laser printers use which technology to print an image?
A) bit-mapped graphics　B) presentation graphics　C) vector graphics　D) precoded dot patterns

23. What is the term used to describe gradations of shadings from white to black when a signal from an RGB graphics board is sent to a monochrome screen?
A) gray lock　B) gray scale　C) black and white　D) monochrome shading

24. Which of the following characterize color printing?
A) its hardware is more expensive than color computer screens　C) it relies on the CMYK color process
B) it is like the four-color process in magazine production　D) all of these

25. What is the difference between paint and draw graphics programs?
A) paint is pixel-based, draw is object-based　C) paint works only on color screens, draw works on any type screen
B) draw is pixel-based, paint is object-based　D) there is no difference

26. Signals passed along a phone line in the form of waves are called:
A) digital signals　B) electric signals　C) analog signals　D) pulse signals

27. The speed of data transmission over communications lines by a modem is measured as the ___ rate, and expressed as ___.
A) bit, bps　B) baud, bpm　C) baud, bps　D) byte, bpm

28. What allows a user to log onto a remote computer over the Internet and work at long distance?
A) FTP　B) Telnet　C) HTML　D) none of these

29. Consider the sentence "The banana gave George to the hungry monkey." If a computer program reported that the sentence was proper, we might reasonably conclude that the program could analyze:
A) semantics but not syntax　B) both semantics and syntax　C) syntax but not semantics　D) neither semantics or syntax

30. Exploratory methods for solving problems often consisting of ad hoc rules that can be applied in particular situation for automated understanding are called:
A) virtual reality　B) heuristics　C) knowledge engineering　D) production rules

31. An encoding system used to represent 16 million colors requires a _____ code.
A) 8-bit　B) 16-bit　C) 24-bit　D) 32-bit

32. With even parity and a 7-bit ASCII code, which of the following is incorrect?
A) 01101010　B) 10110111　C) 00100101　D) 11111111

33. A device that modulates digital data onto an analog signal and then demodulates the analog signal back to digital data is a
A) Network Interface Card　B) Multiplexor　C) Modem　D) Codec

34. If temp is a member of the structure weather, and the C statement pw = &weather; has been executed, then which of the following represents temp?
A) *pw.temp　B) (*weather).temp　C) pw.temp　D) pw->temp

35. SQL refers to _____ Language:
A) Sequential Quality　B) Standard Query　C) Semantic Quality　D) Structured Query

36-40. Match the following terms with one of the descriptions listed below. Look for the best fit.
A) Office automation systems　B) End user computing systems　C) Strategic information systems
D) Expert systems　E) Database management systems　F) Executive information systems
G) Decision support systems　H) Data processing systems　I) Management information systems
　(36)　1. concerned with transaction handling and record-keeping, usually for a particular functional area.
　(37)　2. Designed specifically for decision support at the tactical and strategic levels of management.
　(38)　3. Designed to address semistructured and unstructured problems.
　(39)　4. Provide direct support for the activities of end users.
　(40)　5. Serve as consultants to end users.

II. Short Answer (60%):

1. (6 pts) Fill in the blanks of the following table with equivalent bit patterns (all in 7-bit) or values.

Decimal	Sign-Magnitude	Excess-64	2's complement
(1)	(2)	1101011	(3)
(4)	(5)	(6)	1111011

2. (6 pts) During program execution the CPU continually repeats three steps; depict the so-called machine cycle. What are the two special-purpose registers within the control unit inside the CPU? Explain how they are used during the machine cycle.

3. (6 pts) Explain the following AI-related terms: (1) Turing test, (2) Production system, (3) First-order predicate calculus.

4. (4 pts) Explain the following terms for object oriented programming: (1) encapulation and information hiding, (2) polymorphism.

5. (4 pts) Categorize the following languages into the four programming paradigms such as functional, object-oriented, … etc.
   • LISP　　• Cobol　　• Pascal　　• C　　• Java　　• Ada　　• Prolog　　• SIMULA　　• GPSS

6. (4 pts) Consider the following grammar:

```
<asg>    ::= id = <term>;
<exp>    ::= id * <exp> | id * <term>
<term>   ::= id + <term> | (<exp>) | id
```

   Assume that the scanner will report token type *id* when it sees a valid C identifier. Which of the following strings is a valid sentence (i.e., an `<asg>`) and which is invalid in the language generated by this grammar?

   (a) `albert = b + c;`　　　　　　(b) `d = b * c;`
   (c) `x = b + (c * d + e);`　　　(d) `a = b + (c * d);`

7. (4 pts) Draw a binary tree representation of the postfix expression `2 3 4 5 + * +` and write its infix expression.

8. (4 pts) What is meant by data independence in DBMS system? How does the relational model provide for data independence?

9. (4 pts) What is the difference in the information supplied by the single relation (A) and the two relations (B)?

   (A)

Name	Department	Telephone-number
Jones	Sales	111-2222
Smith	Sales	111-3333
Baker	Personnel	111-4444

   (B)

Name	Department
Jones	Sales
Smith	Sales
Baker	Personnel

Department	Telephone-number
Sales	111-2222
Sales	111-3333
Personnel	111-4444

10. (4 pts) Suppose we apply both Test1 and Test2 (defined below) to the input value 1. What is the difference in the printed output of the two routines?

    procedure Test1 (count)
    　　assign Count the value of the input number;
    　　if (count not 4)
    　　　　then (print the value assigned to Count and
    　　　　　　apply Test1 to the value Count + 1)

    procedure Test2 (count)
    　　assign Count the value of the input number;
    　　if (count not 4)
    　　　　then (apply Test2 to the value Count + 1 and
    　　　　　　print the value assigned to Count)

11. (6 pts) We try to compute `n!`. What's wrong with the following function? How about replacing `n--` with `--n`?

```c
int factorial(int n)
{
    if (n <= 1)
        return 1;
    else
        return n * factorial(n--);
```

12. (4 pts) What does the following function do?

```c
void recurs(int n)
{
    if (n>>1)
        recurs(n>>1);
    putchar('0' + n%2);
    return;
}
```

13. (4 pts) The following two Pascal program segments have the same result; which one is more efficient in using computer? Explain your answer. (Hint: Pascal generally uses row-major order.)

```
(1) for I := 1 to 10 do
        for J := 1 to 1000 do
            A[I, J] := B[I, J] + C[I, J];
(2) for J := 1 to 1000 do
        for I := 1 to 10 do
            A[I, J] := B[I, J] + C[I, J];
```