PART I. Choice

1. Which one is the postfix notation of the prefix arithmetic expression \( +A+BC/D-\ EF \)?
   (A) \( ABC^+D/EF-+ \)  (B) \( AB+C^*DEF/-+ \)  (C) \( ABC^+D/E-F+ \)  (D) \( ABC^+DEF/-+ \)
   (E) \( AB+C^*DE-F/+ \)

2. Which feature is not adopted in JAVA language?
   (A) pointer  (B) thread  (C) object  (D) array  (E) string

3. Which protocol can be used to transmit E-mail?
   (A) HTTP  (B) SMTP  (C) SNMP  (D) MSN  (E) ASP

4. Which SQL command can perform a JOIN operation for two or more tables in a database?
   (A) CREATE  (B) SELECT  (C) UPDATE  (D) INSERT  (E) DELETE

5. Which decimal number is equal to octal number \( (34.25)_8 \)?
   (A) 28.125  (B) 28.2  (C) 28.25  (D) 28.375  (E) none of the above

6. Which data structure is usually used in the compiler to handle recursive calls?
   (A) array  (B) linked list  (C) queue  (D) stack  (E) tree

7. How much storage space roughly does an uncompressed wave file record a minute of stereo music sampling at 22kHz and 16 bits?
   (A) 0.35MB  (B) 1.3MB  (C) 2.6MB  (D) 11MB  (E) 21MB

8. The IEEE's 802.11g standard defines the way wireless LAN gear communicates at up to ______ Mbps.
   (A) 802  (B) 54  (C) 48  (D) 24  (E) 11

9. The newest process technology for TSMC is 90-Nanometer. What is a nanometer?
   (A) \( 10^{-3} \) m  (B) \( 10^{-6} \) m  (C) \( 10^{-9} \) m  (D) \( 10^{-10} \) m  (E) \( 10^{-17} \) m

10. What technology enables geographically dispersed computers or computing clusters to dynamically and virtually share applications, data, and computational resources?
     (A) Grid computing  (B) Parallel computing  (C) Smart computing  (D) Centralized computing  (E) Micro computing
PART II. Discussion

11. (10%) Given the following program fragments, please perform an analysis on the time complexity for each of them (using the Big-Oh notation).

<table>
<thead>
<tr>
<th>(a) for (i=1; i &lt; n; i=i*2) sum++;</th>
<th>(b) for (i=0; i &lt; n; i++) for (j=0; j &lt; i; j++) sum++;</th>
</tr>
</thead>
</table>
| (c) for (i=0; i < n; i++) for (j=0; j < i*2; j++) sum++; | (d) int fibon(int n) {
| | int ans;
| | if (n==0 || n==1)
| | ans = n;
| | else
| | ans = fibon(n-1) + fibon(n-2);
| | return(ans); |

12. (10%) Given a fragment of C code as follows, please discuss the result of F(6, 5).

```c
int F(int M, int N)
{
    int result;
    if (N <= 1) return M;
    else return (M + F(M, N-1));
}
```

13. (10%) Without using any C/C++ library function, please write a C (or C++) function - char toupper (char x), which will return the upper case character of x. If x is already an upper case character, return x.

14. (10%) Assume that we have a sorted list of the 20 numbers 2, 4, …, 40.

(a) Draw the binary decision tree for the list. This tree should reflect the possible comparison sequences in a binary search.

(b) How many comparisons does it take to determine that 30 is in the list?

(c) How many comparisons does it take to determine that 21 is not in the list?
15. (10%) Consider the following fragment of C code, please discuss the main task of this function.

```c
void func (struct node *head)
{
    struct node *this, *prev, *next_n;
    next_n = head;
    this = null;
    while (next_n != null)
    {
        prev = this;
        this = next_n;
        next_n = next_n->next;
        this->next = prev;
    }
    head = this;
}
```

16. (10%) A stack may be regarded as a railroad switching network like the one in following figure. Railroad cars numbered 1, 2, 3, ..., n are on the line at the right. Each car can be brought into the stack and removed any time. For instance, if $n = 3$, we could move in 1, move in 2, move in 3, and then take the cars out, producing the new order 3, 2, 1.

(a) For $n = 3$, find all possible permutations that can be obtained.
(b) For $n = 4$, find all possible permutations that can be obtained.
(c) When $n = 6$, can 325641 and 154623 be obtained?

```
    1, 2, 3, ...
```