I. Choice questions: (56% totally, 2% each)

1. In object-oriented programming, a named collection of attributes and behaviors relevant to modeling a given entity for some particular purpose, namely?

2. Which language does not support object-oriented programming?
   a. SmallTalk   b. Fortran   c. Java   d. C++

3. Select a correct one of the following statements:
   a. A single object may belong to several classes.
   b. Many objects can’t be created from the same class.
   c. Two objects of the same class must have the same values for their data.
   d. Two objects of the same class may have the different methods.

4. The time during program execution when memory is allocated to an object, is called object’s
   a. linking time   b. life time   c. compiling time   d. run time

5. Which of the following statements is not the advantage by using dynamic memory allocation in C++ code?
   a. They are appropriate for object-oriented programming.
   b. They make better memory utilization.
   c. They make faster program execution.
   d. They make easier for declaring the unpredictable size of array.

6. Which of the following languages is not a general-purpose language?
   a. Java   b. C   c. Pascal   d. SQL

7. Which of the following statements is not correct?
   a. Java is an interpreted language
   b. Java is an object-oriented language
   c. Java is a compiled language
   d. Java is a cross platform language
8. Which of the following C functions is a pass-by-reference one?
   a. void swap(int x, int y)
   b. void swap(int& x, int& y)
   c. void swap(int* x, int* y)
   d. void swap(int@ x, int@ y)

9. Which of the following language features is not adopted in Java?
   a. pointer  b. array  c. threads  d. class

10. What situation will happen when the following C++ code fragment be executed?
    ```cpp
    char* cp;
    char* cq;
    cq = cp;
    *cp = 'A';
    cq = new char('B');
    cp = cq;
    ```
    a. overriding  b. deadlock  c. overloading  d. memory lose

11. Consider the following program fragment. how many times of the instruction "x = x + 1;" will be executed?
    for (i=1; i<=n; i++)
    for (j=1; j<=i; j++)
    for (k=1; k<=j; k++)
    x = x + 1;
    a. n(n+1)/4  b. n(n+1)(N+2)/6  c. n(n-1)(n+1)/8  d. (n+1)(n+2)(n+3)/12

12. In the following sorting algorithms, the performance function f(n) of which one is not O(n^2)?
    a. Linear selection  b. Quick  c. Bubble  d. Insertion

13. Using the binary search method to search a sorted list of 11 elements. How many times will it take to find an element in the worst case?
    a. 4  b. 3  c. 6  d. 5
14. Consider the following fragments of code. What is the output value if the parameter passing is call-by-value?

<table>
<thead>
<tr>
<th>Main program</th>
<th>Subprogram(x, y, z)</th>
</tr>
</thead>
<tbody>
<tr>
<td>integer a,b,c</td>
<td>x ← y</td>
</tr>
<tr>
<td>a ← 1</td>
<td>y ← z</td>
</tr>
<tr>
<td>b ← 2</td>
<td>z ← 1</td>
</tr>
<tr>
<td>c ← a+b</td>
<td></td>
</tr>
<tr>
<td>fun(a, b, c)</td>
<td></td>
</tr>
<tr>
<td>output c</td>
<td></td>
</tr>
</tbody>
</table>

a. 1  b. 2  c. 3  d. 4

15. As the above fragments of code. What is the output value if the parameter passing is call-by-reference?

a. 1  b. 2  c. 3  d. 4

16. What is the result of the following program?

```c
main()
{
    printf("%d", func(3, 4));
}
```

```c
func(int x, int y)
{
    if (y==0) return(1);
    else return(x * func(x, y-1));
}
```

a. 12  b. 64  c. 81  d. 27

17. Starting from vertex 2, the breadth-first search is used to traverse the vertices in the following graph. Which sequence of the following choices is incorrect?

```
1 - 3 - 4 - 6
2 - 4 - 3 - 6
```

a. 213456  b. 231456  c. 243156  d. 246135

18. As the above description, but the depth-first search is used. Which sequence of the following choices is incorrect?

a. 213456  b. 236541  c. 243156  d. 246531
19. Using inorder traversal to visit the following binary tree. Which sequence of the following choices is correct?

```
  a
 / \
 b   c
|   |
d---e
     |
     f
```

a. dbgeacf  b. dgebacf  c. abdegcf  d. acfbegd

20. Using preorder traversal to visit the above binary tree. Which sequence of the following choices is correct?

```
  a
 / \
 b   c
|   |
|   |
d---e
     |
     f
```

a. dbgeacf  b. dgebacf  c. abdegcf  d. acfbegd

21. A major step to a cashless society would be:

a. EDI  b. VOD  c. ERP  d. EFT

22. Which of the following descriptions about software agents is correct?

a. they are not autonomous  
b. they are not goal-oriented  
c. they are not intelligent  
d. none of the above

23. Which communications protocol is used for high-speed data transmission between computers?

a. asynchronous  b. synchronous  c. microwave  d. none of the above

24. Protection of hardware, facilities, and data storage media from loss/damage is called

a. logical security  b. fault-tolerant  c. cryptography  d. physical security

25. Which of the following descriptions about XML is not correct?

a. XML derives from HTML  
b. XML is an extensible markup language  
c. With XML, you can define your own set of tags  
d. XML creates richer documents than HTML can produce

26. Which of the following is not a distributed object technology?

a. CORBA  b. DCOM  c. XML  d. RMI
27. Which of the following is not in the context of Electronic Commerce (EC)?
   a. ERP    b. CRM    c. SCM    d. E-Procurement    e. all of the above are in the context

28. Which of the following is executed on the WWW server side?
   a. Java Applet    b. Active X control    c. ASP    d. none of the above

II. Answer the following questions:

1. What is printed as a result of executing the following C++ code? (10%)

```cpp
class A {
  public:
    A() { cout << "Null constructor for A" << endl; }
};

class B : public A {
  public:
    B() { cout << "Null constructor for B" << endl; }
    B(int x) { cout << "int constructor for B" << endl; }
};

class C : public B {
  public:
    C() { cout << "Null constructor for C" << endl; }
    C(int x) : B(x) { cout << "int constructor for C" << endl; }
};

void main() {
  A a;
  B b;
  B bAlt(4);
  C c;
  C cAlt(3);
}
```
2. What are the key differences between C++ and Java? (5%) 

3. Write an algorithm to "exchange" the positions of two adjacent nodes, P and Q, in a linked list L. (5%) 

```
L -> P -> Q -> ... 
```

4. Write a recursive algorithm to implement the Fibonacci function. (5%) 

\[
\text{Fibonacci}(n) = \begin{cases} 
0 & \text{if } n = 0 \\
1 & \text{if } n = 1 \\
\text{Fibonacci}(n-1) + \text{Fibonacci}(n-2) & \text{if } n > 1 
\end{cases}
\]

5. Write an algorithm to implement the bubble sort. (5%) 

6. Please describe the most significant characteristics of Web Information Systems (WIS). (6%) 