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I. Multiple Choices (40%, #1-16: 2 points for each, #17-18: 4 points for each):

1. Which is the capability of control the access of multiple threads to any shared resource?
   a. Serialization
   b. Synchronization
   c. Internationalization
   d. None of the above
2. Which frames are used to transport user data and control information relating to user data (piggybacking)?
   a. I-frames
   b. S-frames
   c. V-frames
   d. None of the above
3. Which data structure does not keep its elements in any type of order?
   a. set
   b. queue
   c. list
   d. stack
4. If a set was implemented using a linked list, then what complexity would be testing for containment have?
   a. O(1)
   b. $O(\log_2 n)$
   c. O(n)
   d. $O(n^2)$
5. If we insert into an empty binary search tree the following sequence of nodes with the specified keys, what will be the result?
   Keys: 6, 7, 9, 12, 13, 25, 44
   a. the tree will resemble a list
   b. the tree will be balanced
   c. the root will have key = 12
   d. the root will have key = 44
6. In Java, a class that depends on the interfaces of many other classes is said to be:
   a. cohesive
   b. incohesive
   c. loosely coupled
   d. strongly coupled

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7. In Java, a class's public interface exposes a coherent set of functionality closely related to a single concept. This class is:
   a. coherent
   b. focused
   c. cohesive
   d. coupled
8. Which of these sorts (mergesort, quicksort, heapsort, insertion sort) uses the most memory?
   a. quicksort
   b. insertion sort
   c. heapsort
   d. mergesort
9. Suppose thread one is downloading a 800KB file while another thread is processing the same file on a single CPU machine. Suppose further that one time slice allows the first thread to download about 10KB and that the second thread can process 10KB of the file in one time slice. Approximately how does the time to complete the entire job compare to having a single thread do the work?
   a. the threaded way will be twice as fast
   b. the threaded way will be twice as slow
   c. the time depends heavily on the thread scheduler
   d. both ways will take about the same time
10. Under what conditions are locks unnecessary for multi-threaded programs?
   a. when the threads are all of the same class
   b. when the threads are different classes
   c. when the threads do not share data
   d. when the shared data only has a single method
11. Which of the following scenarios may not cause a deadlock among two threads?
   I thread one is in an infinite loop and has acquired a lock
   II both threads are in an infinite loop, and one thread has acquired a lock
   III both threads are in an infinite loop, and both threads have acquired locks
   a. I
   b. II
   c. III
   d. I, II and III
12. When a socket is created, which Internet address is used?
   a. The address of the computer to which you want to connect
   b. The address of your computer
   c. The address of your ISP
   d. The address of your proxy

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13. How many recursive calls are made from the original call to fib(4) (not counting the original call)?

```
int fib(int n) {   // assumes n >= 0
    if (n <= 1)
        return n;
    else
        return (fib(n - 1) + fib(n - 2));
}
```

a. 1
b. 2
c. 4
d. 8

14. A unique permutation is one that is different from any other generated permutation. How many unique permutations does the string "aaa" have?

a. 0
b. 1
c. 2
d. 3

15. Why does the best recursive method usually run slightly slower than its iterative counterpart?

a. testing the terminating condition takes longer
b. each recursion method call takes processor time
c. multiple recursive cases must be considered
d. checking multiple terminating conditions take more processor time

16. The ____ standard defines interfaces and methods to analyze and modify the tree structure that represents an XML document.

a. JAXP
b. SAX
c. DOM
d. API

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The following code applies to questions 17-18

```
public interface Moveable{ void move();}
public abstract class Animal implements Moveable{
   private String name;
   public abstract void eat();
   public void move(){System.out.println("animal moves");}
   public void sleep(){..}
}
public class Mammal extends Animal{
   public void eat(){System.out.println("gimme meat!");}
   public void regulateTemperature(){..}
}
public class Human extends Mammal{
   public void think(){..}
   public void move(){System.out.println("human walks");}
}
```

17. What is the result of executing the following code:

```
Movable m = new Mammal();
m.eat();
```

a. invoke Animal eat() method
b. invoke Movable eat() method
c. invoke Mammal eat() method
d. compiler error

18. What is the result of executing the following code:

```
Animal a = new Human();
Movable m = a;
m.move();
```

a. invoke Animal move() method
b. invoke Movable move() method
c. invoke Human move() method
d. compiler error

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II. Answer the following questions (60%):

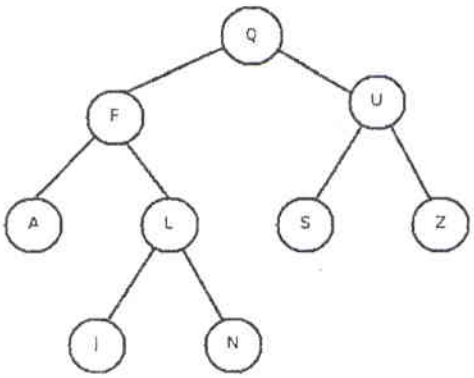
1. (15%, 5 points for each) Describe the output for the following sequence of
   a. Stack operations: push(6), push(3), pop(), push(8), pop()
   b. Queue operations: enqueue(9), enqueuer(8), enqueuer(3), dequeuer(), enqueuer(7), dequeuer(),dequeue()
   c. Deque operations: addFirst(2), addFirst(9), addLast(6), removeLast(), last(),first(), removeFirst()

2. (20%, 2 points for each) Suppose an algorithm tasks 5 seconds to handle a data set of 1,000 records. Fill in the following table, which shows the approximate growth of the execution times depending on the complexity of the algorithm.
   For example, because $3{,}000^2/1{,}000^2=9$, the algorithm would take 9 times as long, or 45 seconds, to handle a data set of 3,000 records.

	O(n)	$O(n^2)$	$O(n^3)$	O(n log(n))	$O(2^n)$
1,000	5	5	5	5	5
2,000	10				x
3,000		45			x
10,000					x

3. (15%) Write a recursive method in JAVA， void reverse () that reverses a sentence. For example:
   Sentence greeting = new Sentence("Hello!");
   greeting.reverse();
   System.out.println(greeting.getText());
   Prints the string "!olleH". Implement a recursive solution by removing the first character, reversing a sentence consisting of the remaining text, and combining the two.

4. (10%, 5 points for each) Given the following tree T, please visit nodes in T with three traversal methods.
   a. What is the POSTORDER traversal of T?
   b. What is the INORDER traversal of T?



備註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。