

Q1. For each of the following multiple-choice questions, choose one correct answer.

1. Java methods are enclosed by these symbols:

- a) { }
- b) ()
- c> " "
- d) //

2. A subclass can access all its superclass variables if they are declared:

- a) Private or public.
- b) Public only.
- c) Protected only.
- d) Protected or public.

3. The sorting algorithm that divides the array into two parts and sort each part recursively is:

- a) Selection sort.
- b) Insertion sort.
- c) Merge sort.
- d) Quick sort.

4. What is the output of the following program:

```
class area {
    int width;
    int length;
    int area;
    void area(int width, int length) {
        this.width = width;
        this.length = length;
    }
}

class Output {
    public static void main(String args[])
    {
        area obj = new area();
        obj.area(5, 6);
        System.out.println(obj.length + " " + obj.width);
    }
}
```

- a) 5 6
- b) 6 6
- c) 6 5
- d) 5 5

5. Which of the following statement about Java interface is incorrect?
- a) A Java interface defines a set of methods that are required.
 - b) A Java interface must contain more than one method.**
 - c) A Java interface specifies behavior that a class will implement.
 - d) All methods in a Java interface must be abstract.
6. A recursion occurs when:
- a) A constructor calls a method.
 - b) A method calls itself.**
 - c) A method calls another method.
 - d) A constructor calls another constructor.
7. Which of the following can potentially be changed when implementing an interface?
- a) The parameters of a method in the interface.
 - b) The name of a method in the interface.
 - c) The return type of a method in the interface.
 - d) None of the above.**
8. Selection sort is _____ algorithm.
- a) $O(n^2)$**
 - b) $O(1)$
 - c) $O(n \log n)$
 - d) $O(\log n)$
9. Which of these packages contains all the classes and methods required for event handling in Java?
- a) java.applet
 - b) java.awt
 - c) java.event
 - d) java.awt.event**
10. Which of the following components generate action events?
- a) Buttons**
 - b) Labels
 - c) Check boxes
 - d) Windows

Q2. For each of the following statements, answer with (True) or (False):

1.	Quick sort algorithm is based on divide and conquer.	T
2.	The Water Fall Model is a sequential process of analysis, design, implementation, testing and deployment.	T
3.	An overriding method cannot extend or replace the functionality of the superclass method.	F
4.	Infinite recursion can occur when a recursive algorithm does not contain a special case to handle the simplest computations directly.	T
5.	Polymorphism denotes the ability to treat objects with differences in behavior in a uniform way.	T
6.	JFrame is a package	F
7.	Programs that use recursion consume less time and memory.	F
8.	An interface has methods but no instance variables.	T
9.	In Linear Search elements must be sorted.	F
10.	Constructor overloading is not possible in Java.	F

Q3. Suppose an algorithm takes 8 second handle a data set (n) of size 400. Fill in the following table, which shows the approximate growth (in seconds) of the execution times depending on the complexity of the algorithm.

Note, that you Must also:

- Show your calculations.
- Sate which algorithm gives the best result and why?
- Sate which algorithm gives the worst result and why?
- Which algorithm is a linear function?

	$O(n)$	$O(n^2)$	$O(\log n)$
4000	80	800	11.04
40000	800	8000	14.14912

The best result is $O(\log n)$ because we used Binary algorithm.

The worst result is $O(n^2)$ because we used selection algorithm.

A linear function is $O(n)$.

Q4. Give brief answers to the following questions:

a) What do you do if a CRC card has ten responsibilities?

Reword the responsibilities so that they are at a higher level, or come up with more classes to handle the responsibilities.

b) Which method of the Object class will make a new object (instance) with the same state as the existing object, so that the new object is a copy of the existing object?

The clone() Method.

c) Fill in the following table to show the steps in which the selection sort algorithm go through to sort the sequence 6 5 4 3 2 1.

Note: there might be more rows than needed.

6	5	4	3	2	1
1	5	4	3	2	6
1	2	4	3	5	6
1	2	3	4	5	6

Q5. Write a method that will receive an integer value and search for it in array of sorted integers using binary search.

```
public int search(int v)
{
    int low = 0;
    int high = a.length - 1;
    while (low <= high)
    {
        int mid = (low + high) / 2;
        int diff = a[mid] - v;
        if (diff == 0) // a[mid] == v
            return mid;
        else if (diff < 0) // a[mid] < v
            low = mid + 1;
        else
            high = mid - 1;
    }
    return -1;
}
```

Q6. Draw the Spiral model diagram and answer the following:

- Give one advantage of this model.
- Give one disadvantage of this model.
- Give two reasons on when to use this model.

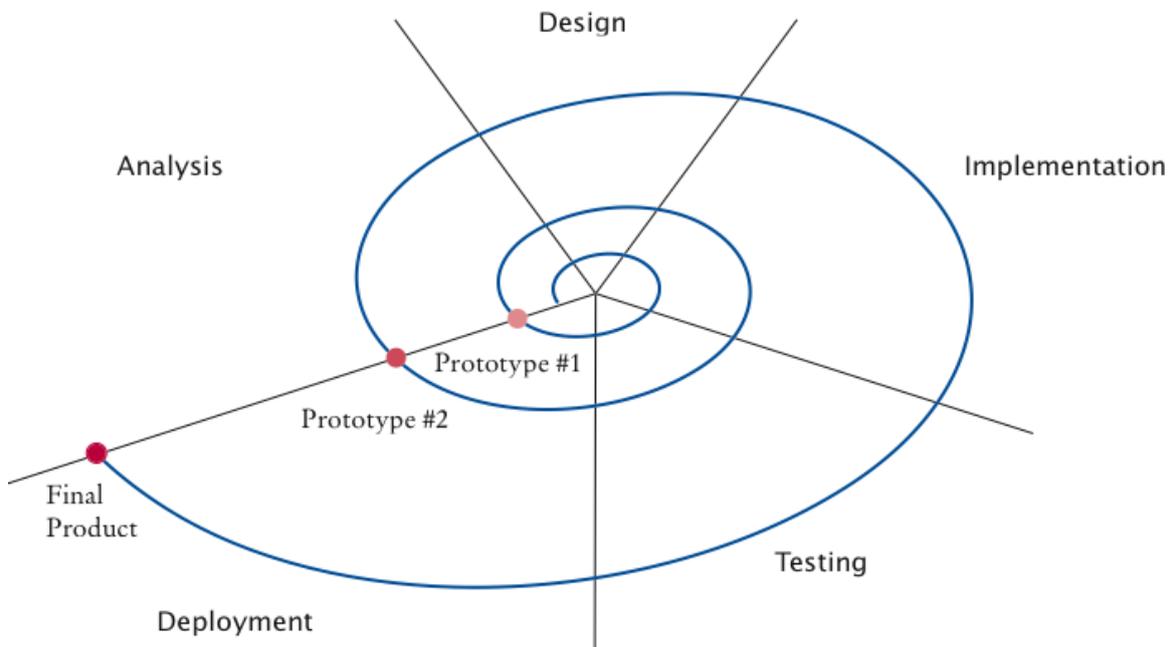


Figure 2 A Spiral Model

Advantages of Spiral model:

- High amount of risk analysis hence, avoidance of Risk is enhanced.
- Good for large and mission-critical projects.
- Strong approval and documentation control.
- Additional Functionality can be added at a later date.
- Software is produced early.

Disadvantages of Spiral model:

- Can be a costly model to use.
- Risk analysis requires highly specific expertise.
- Project's success is highly dependent on the risk analysis phase.
- Doesn't work well for smaller projects.

When to use Spiral model:

- When costs and risk evaluation is important
- For medium to high-risk projects
- Long-term project commitment unwise because of potential changes to economic priorities
- Users are unsure of their needs
- Requirements are complex
- New product line
- Significant changes are expected (research and exploration)