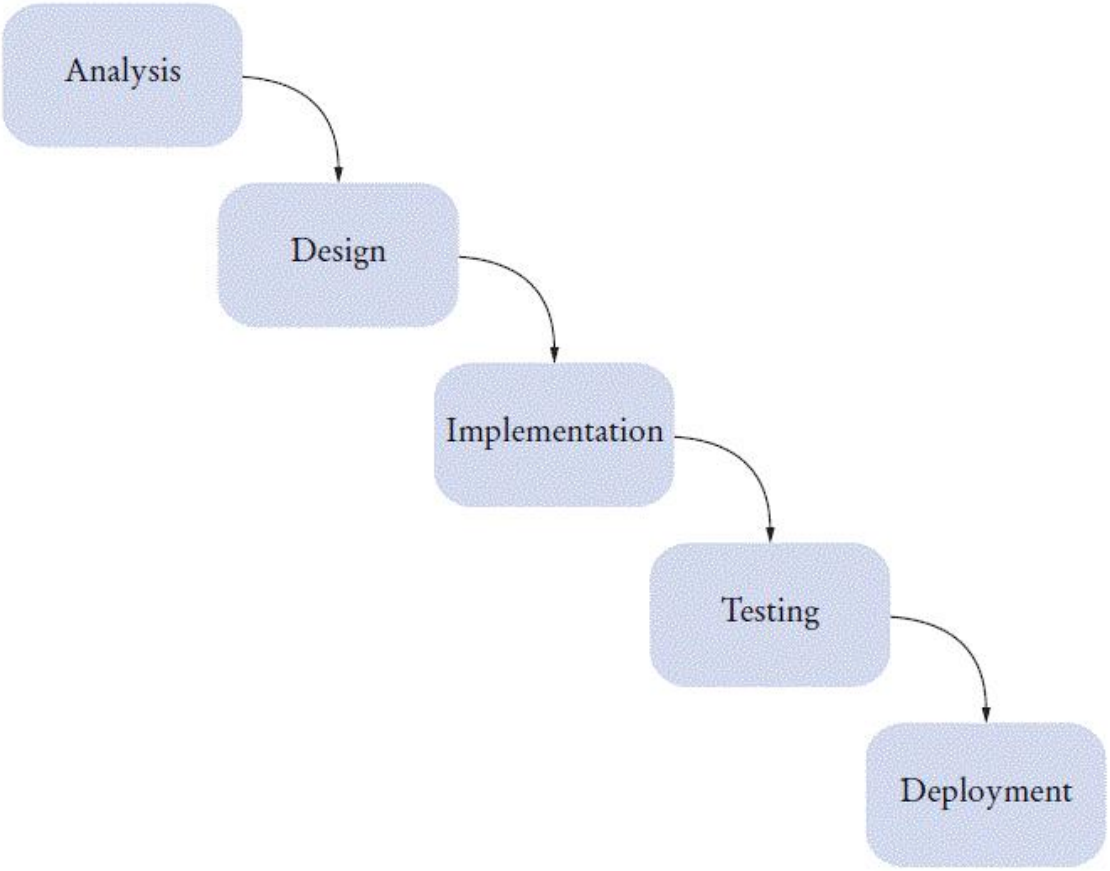
Ghannam A. Alghannam

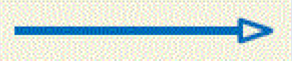
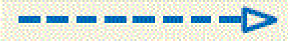
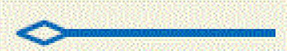
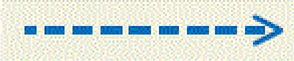
Q1)

Waterfall model:

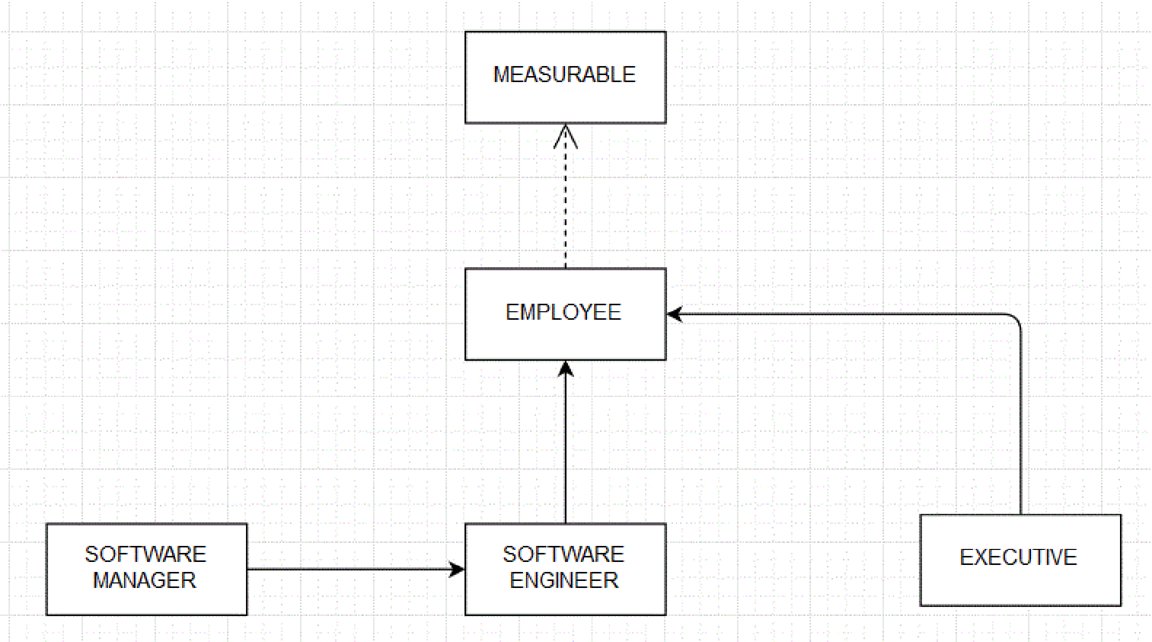
- It describes a sequential process of analysis, design, implementation, testing, and deployment
- The Waterfall Model was first Process Model to be introduced. It is also referred to as a linear-sequential life cycle model. It is very simple to understand and use. In a waterfall model, each phase must be completed fully before the next phase can begin. This type of model is basically used for the for the project which is small and there are no uncertain requirements. At the end of each phase, a review takes place to determine if the project is on the right path and whether or not to continue or discard the project. In this model the testing starts only after the development is complete. In waterfall model phases do not overlap.
- **Advantages of waterfall model:**
  - This model is simple and easy to understand and use.
  - It is easy to manage due to the rigidity of the model – each phase has specific deliverables and a review process.
  - In this model phases are processed and completed one at a time. Phases do not overlap.
  - Waterfall model works well for smaller projects where requirements are very well understood.
- **phases of the development process**
  - Analysis
  - Design
  - Implementation
  - Testing
  - Deployment

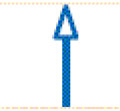

Analysis
Design
Implementation
Testing
Deployment

Q2)

Relationship	Draw	Type of relationship
Inheritance		**IS-A Relationship**
Interface Implementation		
Aggregation		**HAS-A Relationship**
Dependency		**USES Relationship**

Q3.





CRC CARDS:

Employee
Get the Employee info
Manage state (work)
Manage Employee info

Executive	
Get the Executive Employee info	Employee
Get Job type	
Manage Employee info	

Software Engineer	
Get the Software Engineer Employee info	Employee
Get Job type	
Manage Employee info	

Software Manager	
Get the Software Manager Employee info	Employee
Get Job type	
Manage Employee info	

Q4)

```
          import java.util.Scanner;
          public class ghannam {
          public static void main(String args[])
             {
                Scanner in = new Scanner(System.in);
                System.out.print("Enter number: ");
                int  number = in.nextInt();

                System.out.println("The value "+ number + " , The factorial is
          "+recursive(number));
             }
             public static int recursive(int number)
             {
               if (number == 1)    return   1;
               else    return   number * recursive(number - 1);
             }
}
```

```
run:
Enter number: 4
The value 4 , The factorial is  24
BUILD SUCCESSFUL (total time: 3 seconds)
```

Q5.

1. Advantages
   - Simple and fast to code
   - Less effort and will be easily understood by others
   - Recursion adds clarity and (sometimes) reduces the time needed to write and debug code (but doesn't necessarily reduce space requirements or speed of execution).
   - Reduces time complexity.
   - Performs better in solving problems based on tree structures.
   - It is the unique way of implementing a variable number of nested loops (and the only elegant way of implementing a big constant number of nested loops).
2. Disadvantages :
   - Slow over iterative approach
   - More memory consumption because of the recursion stack
   - Recursive methods will often throw a StackOverflowException when processing big sets. Recursive loops don't have this problem though.

Q6.

- A common programming error is an infinite recursion: a method calling itself over and over with no end in sight. The computer needs some amount of memory for bookkeeping for each call. After some number of calls, all memory that is available for this purpose is exhausted. Your program shuts down and reports a “stack overflow”.
- Infinite recursion happens either because the parameter values don’t get simpler or because a special terminating case is missing. For example, suppose the getArea method was allowed to compute the area of a triangle with width 0. If it weren’t for the special test, the method would construct triangles with width –1, –2, –3, and so on.