}

WEEK6 ASSIGNMENT

QUESTION1-

App.JAVA

```
import java.text.DecimalFormat;


import org.springframework.context.ApplicationContext; import
org.springframework.context.support.ClassPathXmlApplicationContext;


//main class public
class App {


        public static void main(String[] args) {
                // TODO Auto-generated method stub


                //spring.xml file is invoked
                ApplicationContext context = new ClassPathXmlApplicationContext("Spring.xml");
                //down casting from object to string
    BillCalculator bill = (BillCalculator)context.getBean("bill");


    String pattern="##.0";
    DecimalFormat df=new DecimalFormat(pattern);


    //calling method of POJO class
    System.out.println("Total bill to pay is $"+(df.format(bill.calculateBill())));
    }
}
```

BILL CALCULATOR .JAVA

```java
 public class BillCalculator
{
      //fields
      private int  units;
      private double tax;
      private double unitPrice;

      //default constructor
public BillCalculator() {
            this(0,0.0d,0.0d);
      }

      //parameterized constructor
      public BillCalculator(int units,double tax,double unitPrice) {
            this.units=units;
this.tax=tax;
this.unitPrice=unitPrice;
            }

      //method
      public double calculateBill() {
            return (unitPrice+(unitPrice*tax))*units;






      }
}
```

Spring.xml

```xml
<?xml version="1.0" encoding="UTF-8"?>
<beans
 xmlns="http://www.springframework.org/schema/beans"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:p="http://www.springframework.org/schema/p"
xsi:schemaLocation="http://www.springframework.org/schema/beans
http://www.springframework.org/schema/beans/spring-beans-3.0.xsd">


<bean id="bill" class="com.mybank.bank.BillCalculator">
<constructor-arg name="units" value="100" type="int"></constructor-arg>
<constructor-arg name="tax" value="0.18" type="double"></constructor-arg>
<constructor-arg name="unitPrice" value="10.0 "
type="double"></constructor-arg>
</bean>
</beans>
```

Junit test

```
import static org.junit.jupiter.api.Assertions.*;


import org.junit.jupiter.api.Test;
//Testing the BillCalculator class
class      TestBillCalculator      {
        //initialization          by
constructor
        BillCalculator bcal= new BillCalculator(100,0.18,10.0);

        //calculateBill() method is tested
        @Test
        void testCalculateBill() {
                //1st param - expected value, 2nd param- actual value, 3rd param- difference btw
actual and expected values                  assertEquals (1180.339,bcal.calculateBill(),0.4);
        }
}
```

Pom.xml

```
<project xmlns="http://maven.apache.org/POM/4.0.0"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://maven.apache.org/POM/4.0.0
http://maven.apache.org/xsd/maven-4.0.0.xsd">
  <modelVersion>4.0.0</modelVersion>

  <groupId>com.mybank</groupId>
  <artifactId>Week6_Q1</artifactId>
  <version>0.0.1-SNAPSHOT</version>
<packaging>jar</packaging>

  <name>Week6_Q1</name>
  <url>http://maven.apache.org</url>

  <properties>
    <project.build.sourceEncoding>UTF-8</project.build.sourceEncoding>
</properties>

  <dependencies>
    <dependency>
      <groupId>junit</groupId>
      <artifactId>junit</artifactId>
      <version>3.8.1</version>
      <scope>test</scope>
    </dependency>

      <!--
https://mvnrepository.com/artifact/org.springframework/springcontext  -->
<dependency>
<groupId>org.springframework</groupId> <artifactId>spring-
context</artifactId> <version>5.3.23</version>
</dependency>

<!-- https://mvnrepository.com/artifact/org.springframework/spring-
contextsupport --> <dependency>
<groupId>org.springframework</groupId>
<artifactId>spring-context-support</artifactId>
<version>5.3.23</version>
</dependency>

  </dependencies>
</project>
```

Question 2-

Billcalcultor.java

```
package com.mybank.bean;

import org.springframework.stereotype.Component;

@Component
public class BillCalculator {
      //fields
 private int  units;   private
double tax;
      private double unitPrice;

      //default constructor
public BillCalculator() {
            this(0,0.0d,0.0d);
      }
      //parameterized constructor
      public BillCalculator(int units,double tax,double unitPrice) {
            this.units=units;
this.tax=tax;
this.unitPrice=unitPrice;
            }


      //method
      public double calculateBill() {
            return (10.0+(10.0*0.18))*10;
      }
 }
```

SPRINGCONFIGURATION.JAVA

import org.springframework.context.annotation.ComponentScan; import

org.springframework.context.annotation.Configuration; //bean class

package is invoked by the help of annotation

@Configuration

```
@ComponentScan(basePackages = "com.mybank.bean")
public class SpringConfiguration {



}
```

APP.JAVA

```
package com.mybank.ui;

import java.text.DecimalFormat;

import org.springframework.context.ApplicationContext; import
org.springframework.context.annotation.AnnotationConfigApplicationContext;

import com.mybank.bean.BillCalculator; import
com.mybank.configuration.SpringConfiguration;

//main class(user interface class)  public
class App {

        public static void main(String[] args) {
                // TODO Auto-generated method stub
                //Configuration class is invoked
                 ApplicationContext applicationContext = new
AnnotationConfigApplicationContext(SpringConfiguration.class);

                 //Spring's Application Context initializes the beans by calling getBean method
            BillCalculator bill = (BillCalculator) applicationContext.getBean(BillCalculator.class);
String pattern="##.0";
```

```
                DecimalFormat df=new DecimalFormat(pattern);

                //Bean class(BillCalculator) method is called
                    System.out.println("Total bill to pay is $"+(df.format(bill.calculateBill())));
            }

    }
```

POM.XML

```
<project xmlns="http://maven.apache.org/POM/4.0.0"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://maven.apache.org/POM/4.0.0
http://maven.apache.org/xsd/maven-4.0.0.xsd">
  <modelVersion>4.0.0</modelVersion>

  <groupId>com.mybank</groupId>
  <artifactId>Week6_Q2</artifactId>
  <version>0.0.1-SNAPSHOT</version>
<packaging>jar</packaging>

  <name>Week6_Q2</name>
  <url>http://maven.apache.org</url>

  <properties>
    <project.build.sourceEncoding>UTF-8</project.build.sourceEncoding>
    <maven.compiler.target>1.8</maven.compiler.target>
      <maven.compiler.source>1.8</maven.compiler.source>
  </properties>

  <dependencies>
    <dependency>
      <groupId>junit</groupId>
      <artifactId>junit</artifactId>
      <version>3.8.1</version>
      <scope>test</scope>
    </dependency>

    <dependency>
<groupId>org.springframework</groupId>
<artifactId>spring-context</artifactId>
<version>5.3.18</version>
</dependency>
```

```
  </dependencies>
</project>
```

Question 3-

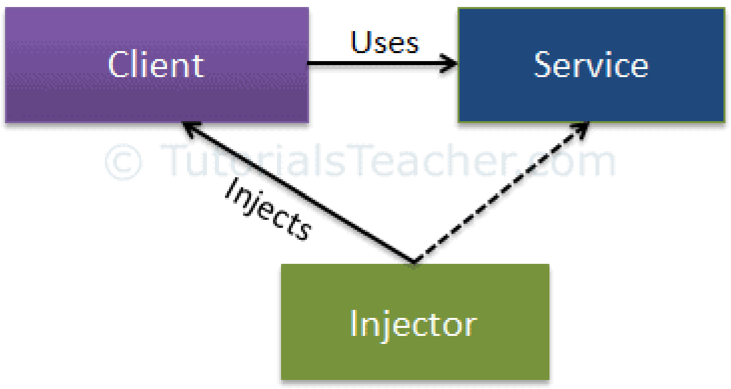
Dependency Injection:

Dependency Injection (DI) is a design pattern used to implement IoC. It allows the creation of dependent objects outside of a class and provides those objects to a class through different ways. Using DI, we move the creation and binding of the dependent objects outside of the class that depends on them.

The Dependency Injection pattern involves 3 types of classes.

1. **Client Class:** The client class (dependent class) is a class which depends on the service class
2. **Service Class:** The service class (dependency) is a class that provides service to the client class.
3. **Injector Class:** The injector class injects the service class object into the client class

The following figure illustrates the relationship between these classes:



Dependency Injection

Types of Dependency Injection:

As you have seen above, the injector class injects the service (dependency) to the client (dependent). The injector class injects dependencies broadly in three ways: through a constructor, through a property, or through a method.

1.Constructor Injection

2.Property Injection

3.Method Injection

1.Constructor Injection: In the constructor injection, the injector supplies the service (dependency) through the client class constructor.

2.Property Injection: In the property injection (aka the Setter Injection), the injector supplies the dependency through a public property of the client class.

3.Method Injection: In this type of injection, the client class implements an interface which declares the method(s) to supply the dependency and the injector uses this interface to supply the dependency to the client class.

Example of Constructor Injection:

```
<bean id="project" class="app.myspringapp.Project">
                <constructor-arg value="MIS"></constructor-arg>
                <constructor-arg value="San Diago"></constructor-arg>
</bean>
```

Inversion of Control:

Spring IoC (Inversion of Control) Container is the core of Spring Framework. It creates the objects, configures and assembles their dependencies, manages their entire life cycle. The Container uses Dependency Injection(DI) to manage the components that make up the application. It gets the information about the objects from a configuration file(XML) or Java Code or Java Annotations and Java POJO class. These objects are called Beans. Since the Controlling of Java objects and their lifecycle is not done by the developers, hence the name Inversion of Control.

There are 2 types of Ioc containers:

1**.**Bean Factory

2.Application Context

That means if you want to use an IoC container in spring whether we need to use a BeanFactory or ApplicationContext. The BeanFactory is the most basic version of IoC containers, and the ApplicationContext extends the features of BeanFactory. The followings are some of the main features of Spring IoC,

- Creating Object for us.
- Managing our objects.
- Helping our application to be configurable.
- Managing dependencies.

Example of Ioc Containers:

```
public class Mobile {     public static void
main(String[] args) {
        // Using ApplicationContext tom implement Spring IoC
ApplicationContext applicationContext = new
ClassPathXmlApplicationContext("beans.xml");

// Get the bean
Sim sim = applicationContext.getBean("sim", Sim.class);

// Calling the methods
sim.calling(); sim.data();
    }
}
```

And now if you want to use the Airtel sim so you have to change only inside the **beans.xml** file. The main method is going to be the same.

```
<bean id="sim" class="Airtel"></bean>
```