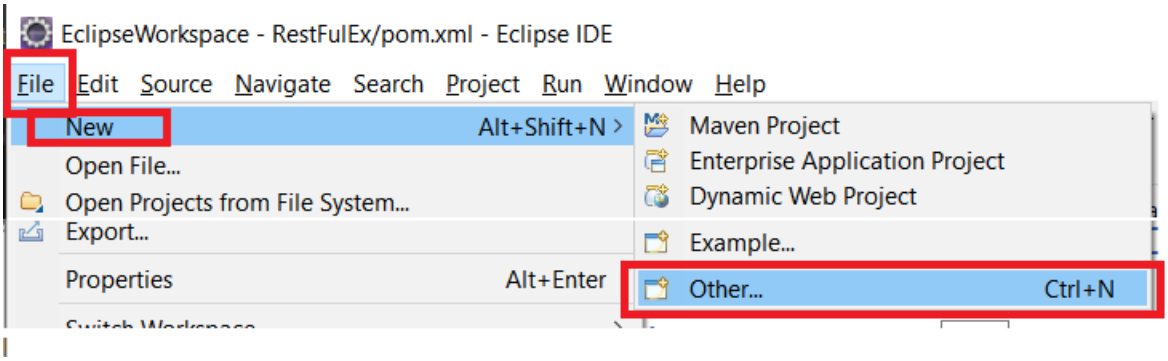
Aspect Oriented Programming

1. Write a program to demonstrate Spring AOP – before advice.
2. Write a program to demonstrate Spring AOP – after advice.
3. Write a program to demonstrate Spring AOP – around advice.
4. Write a program to demonstrate Spring AOP – after returning advice.
5. Write a program to demonstrate Spring AOP – after throwing advice.
6. Write a program to demonstrate Spring AOP – pointcuts.

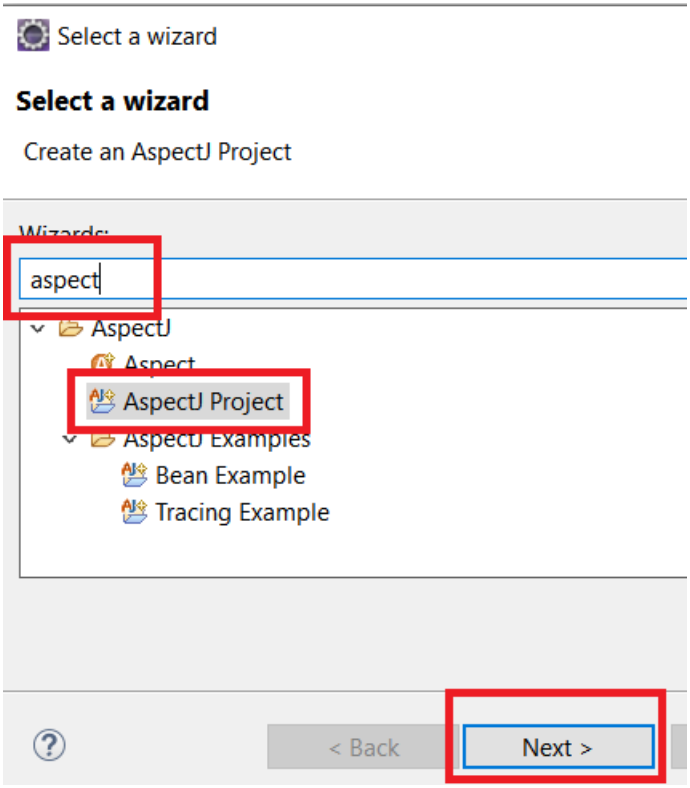
Steps to Create an AOP Project

Step 1 : Creating AspectJ Project.

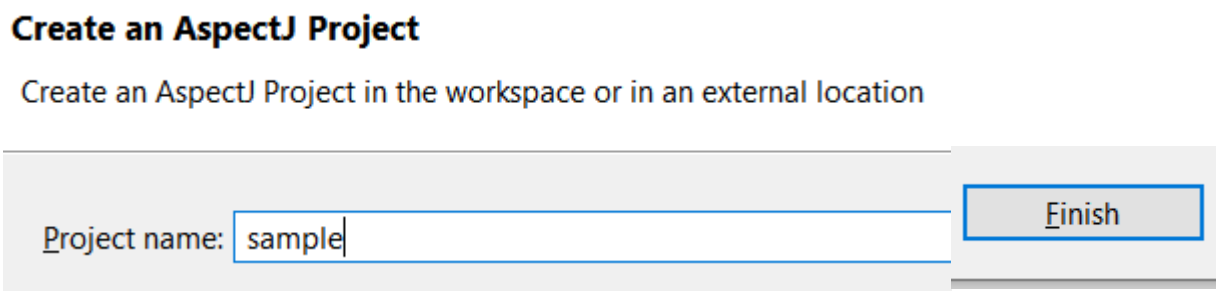
1.1 : Open Eclipse. Go To File > New > Other.



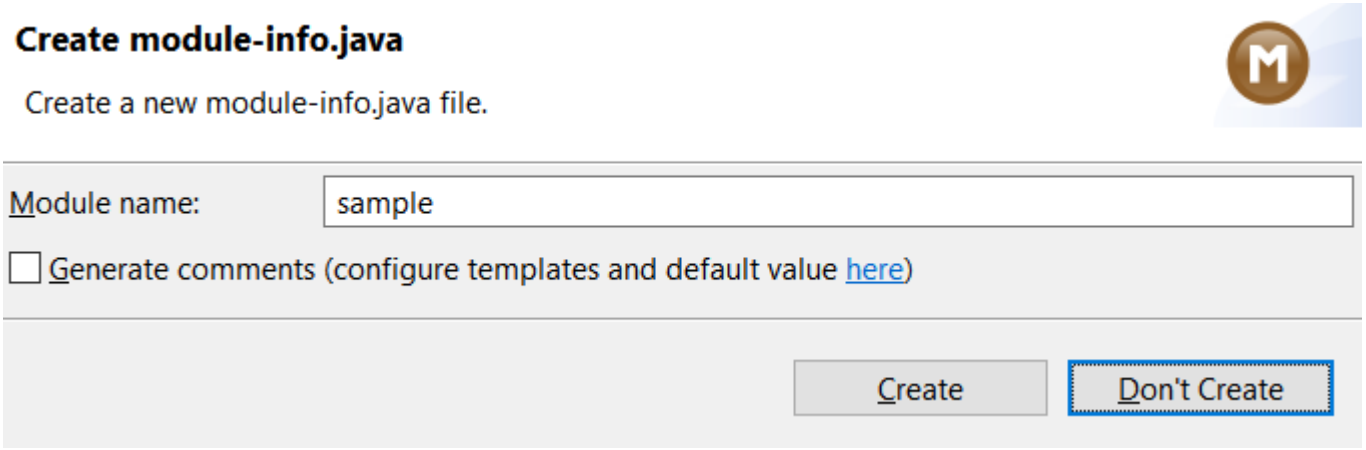
1.2 : Search for 'aspect' and Select 'AspectJ Project'. Then Click on Next.



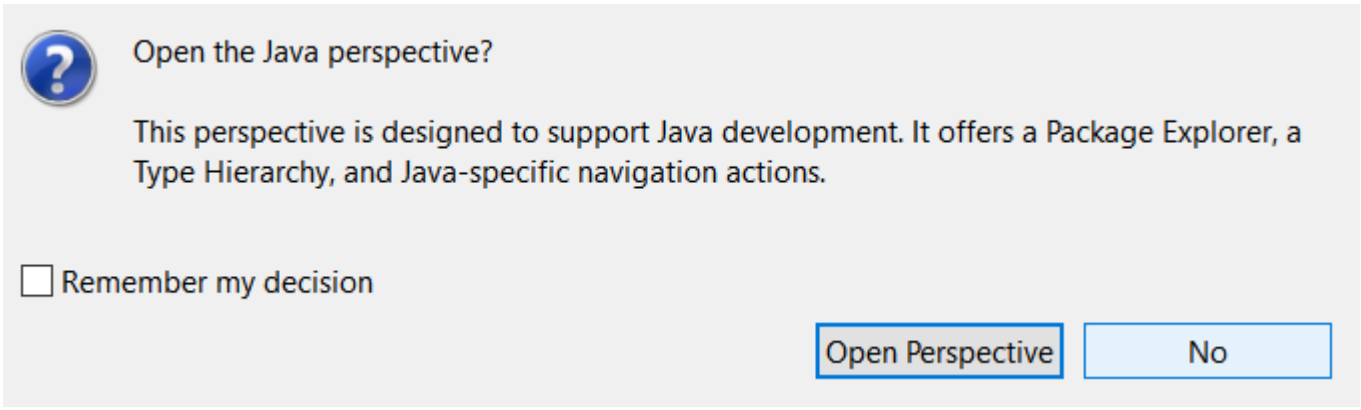
1.3 : Enter Project Name of your wish, and click on Finish.



1.4 : If asked to create module-info.java file, select 'Don't Create'.



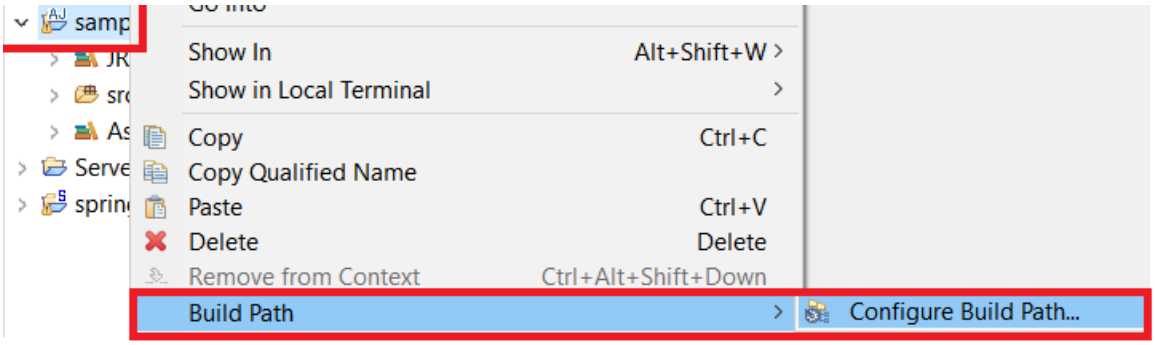
1.5 : Finally if you are asked to Open Java Perspective, just choose **NO.**



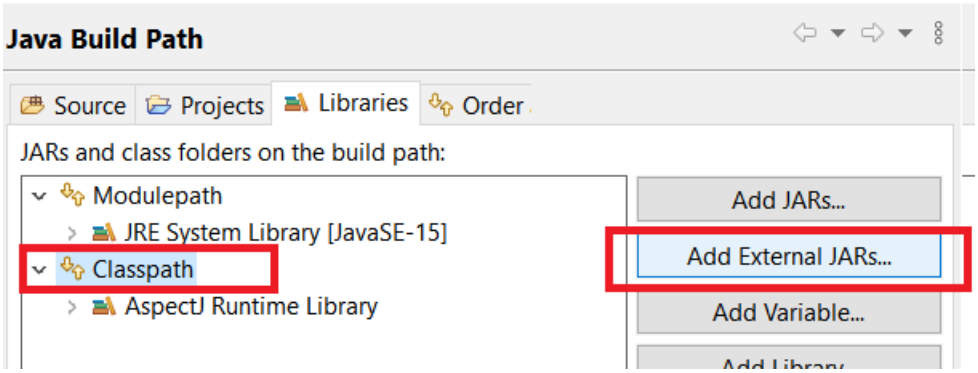
This creates your AspectJ project.

Step 2 : Adding the Spring Libraries.

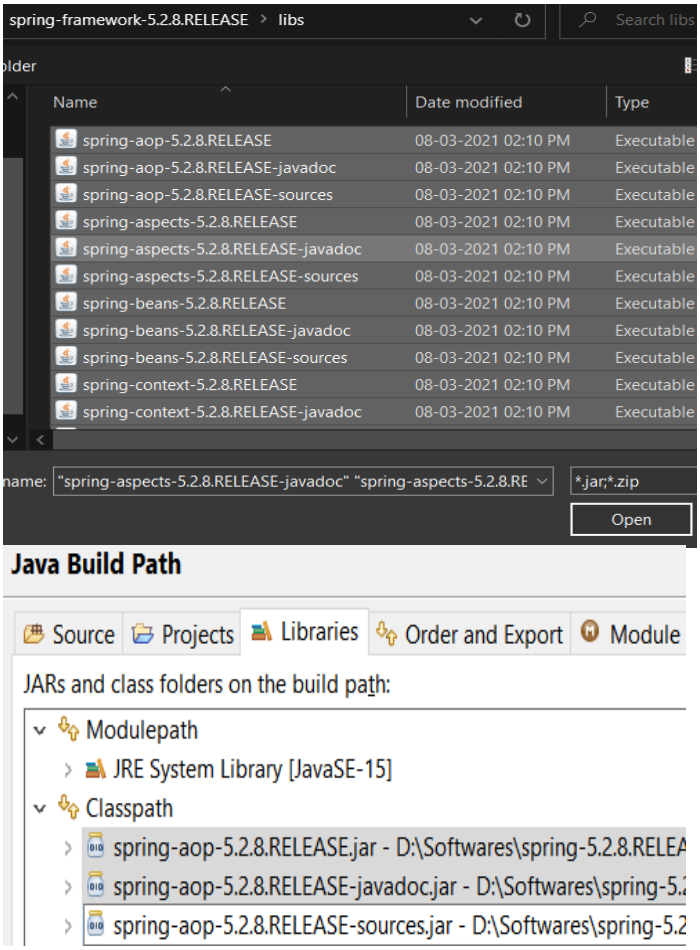
2.1 : Right click on your Newly created AspectJ project, Choose Build Path > Configure Build Path.



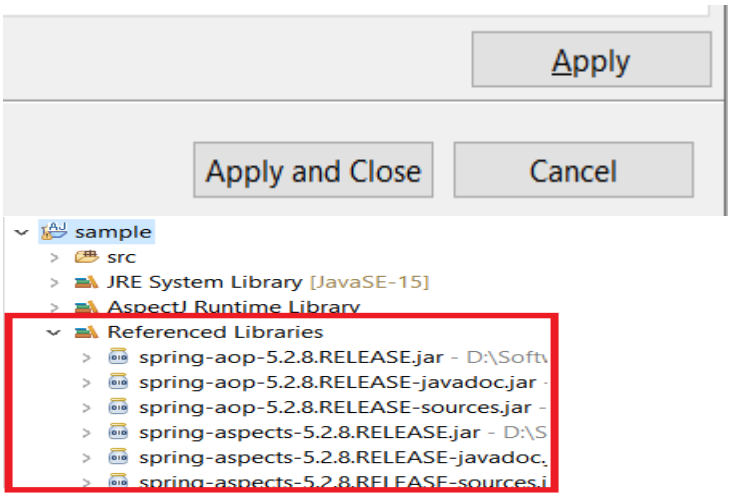
2.2 On Java Build Path wizard, Choose **Classpath**and then select **Add External JARs.**



2.3 : Choose all the Spring Libraries you've downloaded, and click on OPEN. This will add all libraries to Classpath.



2.4 Finally click on Apply & Close, now you are ready to work with Aspects in Spring.



Problem Statement 1 : Write a program to demonstrate Spring AOP – before advice.

Solution :

beforeaop.java

```
package bvimit.edu;

import org.aspectj.lang.JoinPoint;
import org.aspectj.lang.annotation.Aspect;
import org.aspectj.lang.annotation.Before;
import org.aspectj.lang.annotation.Pointcut;

@Aspect
public class beforeaop {

	@Pointcut("execution(int beforeoperation.*(..))")
	public void p(){}

	@Before("p()")
	public void myadvice(JoinPoint jp)
	{
		System.out.println("before advice");
	}
}
```

beforeoperation.java

```
package bvimit.edu;

public class beforeoperation {
    public void msg() {System.out.println("method 1");}
    public int m(){System.out.println("method 2 with return");return 2;}
    public int k(){System.out.println("method 3 with return");return 3;}
    }
```

aopctx1.xml

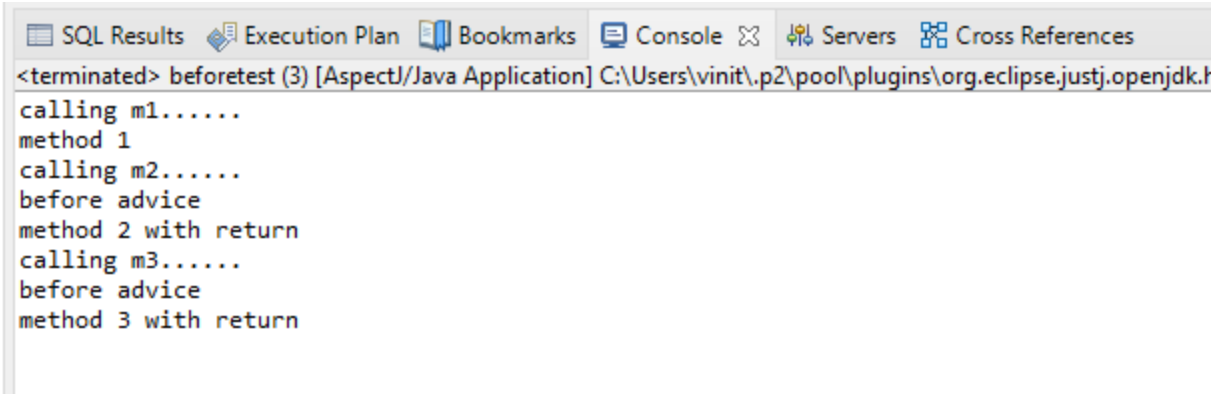
```
<?xml version="1.0" encoding="UTF-8"?>
<beans xmlns="http://www.springframework.org/schema/beans"
	xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
	xsi:schemaLocation="http://www.springframework.org/schema/beans
http://www.springframework.org/schema/beans/spring-beans.xsd">

  <bean id="opBean" class="bvimit.edu.beforeoperation">  </bean>
```

```
   <bean id="trackMyBean" class="bvimit.edu.beforeaop"></bean>



   <bean
class="org.springframework.aop.aspectj.annotation.AnnotationAwareAspectJAutoProxyCreator
"></bean>

</beans>
```

beforetest.java

```
package bvimit.edu;

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

public class beforetest {

        public static void main(String[] args) {
                ApplicationContext context = new
ClassPathXmlApplicationContext("aopctx1.xml");
                beforeoperation e = (beforeoperation) context.getBean("opBean");
                System.out.println("calling m1......");
                e.msg();
                System.out.println("calling m2......");
                e.m();
                System.out.println("calling m3......");
                e.k();


        }

}
```

Output :


SQL Results
Execution Plan
Bookmarks
Console
Servers
Cross References
<terminated> beforetest (3) [AspectJ/Java Application] C:\Users\vinit\.p2\pool\plugins\org.eclipse.justj.openjdk.h
calling m1......
method 1
calling m2......
before advice
method 2 with return
calling m3......
before advice
method 3 with return

Problem Statement 2 : Write a program to demonstrate Spring AOP – after advice.

Solution :

Afteraopdata.java

```
package bvimit.edu;

import org.aspectj.lang.JoinPoint;
import org.aspectj.lang.annotation.After;
import org.aspectj.lang.annotation.Aspect;
import org.aspectj.lang.annotation.Pointcut;

@Aspect
public class afteraopdata {

	@Pointcut("execution(int afteroperation.*(..))")
	public void p(){}

	@After("p()")
	public void myadvice(JoinPoint jp)
	{
		System.out.println("after advice");
	}
}
```

afteroperation.java

```
package bvimit.edu;

public class afteroperation {
    public void msg() {System.out.println("method 1");}
    public int m(){System.out.println("method 2 with return");return 2;}
    public int k(){System.out.println("method 3 with return");return 3;}
    }
```

aopctx.xml

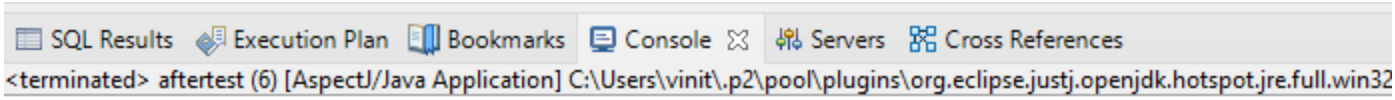
```
<?xml version="1.0" encoding="UTF-8"?>
<beans xmlns="http://www.springframework.org/schema/beans"
	xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
	xsi:schemaLocation="http://www.springframework.org/schema/beans
http://www.springframework.org/schema/beans/spring-beans.xsd">

  <bean id="opBean" class="bvimit.edu.afteroperation">  </bean>
```

```
   <bean id="trackMyBean" class="bvimit.edu.afteraopdata"></bean>



   <bean
class="org.springframework.aop.aspectj.annotation.AnnotationAwareAspectJAutoProxyCreator
"></bean>
</beans>
```

aftertest.java

```
package bvimit.edu;

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

public class aftertest {

        public static void main(String[] args) {
                ApplicationContext context = new
ClassPathXmlApplicationContext("aopctx.xml");
                afteroperation e = (afteroperation) context.getBean("opBean");
                System.out.println("calling m1......");
                e.msg();
                System.out.println("calling m2......");
                e.m();
                System.out.println("calling m3......");
                e.k();


        }

}
```

Output :


SQL Results
Execution Plan
Bookmarks
Console
Servers
Cross References
<terminated> aftertest (6) [AspectJ/Java Application] C:\Users\vinit\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32
calling m1......
method 1
calling m2......
method 2 with return
after advice
calling m3......
method 3 with return
after advice

Problem Statement 3 : Write a program to demonstrate Spring AOP – around advice.

Solution :

Bankaopdata.java

```
package bvimit.edu;

import org.aspectj.lang.ProceedingJoinPoint;
import org.aspectj.lang.annotation.Around;
import org.aspectj.lang.annotation.Aspect;
import org.aspectj.lang.annotation.Pointcut;

@Aspect
public class Bankaopdata {

	@Pointcut("execution(* Bank.*(..))")
	public void a() {}

	@Around("a()")
	public Object myadvice(ProceedingJoinPoint p)throws Throwable
	{
		System.out.println("Around concern Before calling actual method");
		Object obj=p.proceed();
		System.out.println("Around Concern After calling actual method");
		return obj;
	}
}
```

Bank.java

```
package bvimit.edu;

public class Bank {
	public void welcome() {System.out.println("welcome to bank");}
	public int icici() {System.out.println("icici bank interest rate");return 7;}
	public int pnb() {System.out.println("pnb bank interest rate");return 6;}

}
```

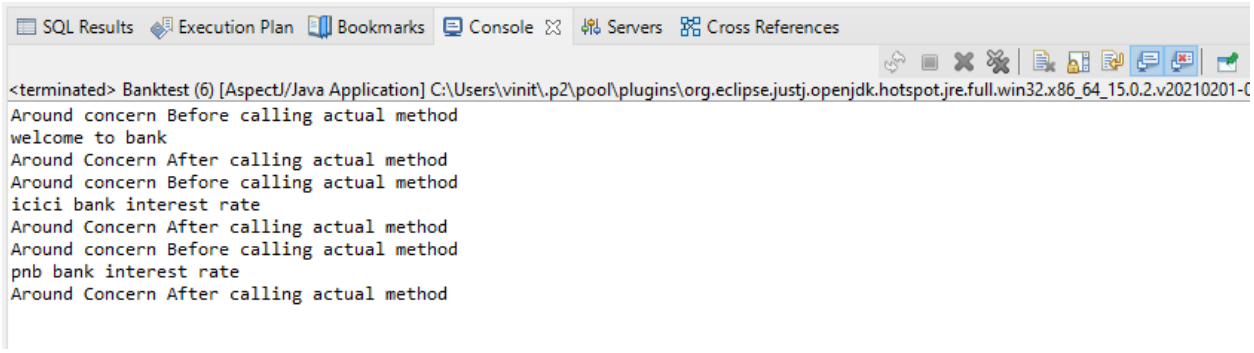
Bankaopdata.xml

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

<bean id="opBean" class="bvimit.edu.Bank"> </bean>
<bean id="trackMyBean" class="bvimit.edu.Bankaopdata"></bean>

<bean
class="org.springframework.aop.aspectj.annotation.AnnotationAwareAspectJAutoProxyCreator
"></bean>
</beans>
```

Banktest.java

```
package bvimit.edu;

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

public class Banktest {

	private static ApplicationContext context;

	public static void main(String[] args) {
		context = new ClassPathXmlApplicationContext("Bankaopdata.xml");

		Bank e =(Bank) context.getBean("opBean");
		System.out.println("Calling welcome method...");
		e.welcome();
		System.out.println("Calling icici method...");
		e.icici();
		System.out.println("Calling pnb method...");
		e.pnb();
	}

}
```

Output :


SQL Results
Execution Plan
Bookmarks
Console
Servers
Cross References
<terminated> Banktest (6) [AspectJ/Java Application] C:\Users\vinit\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_15.0.2.v20210201-
Around concern Before calling actual method
welcome to bank
Around Concern After calling actual method
Around concern Before calling actual method
icici bank interest rate
Around Concern After calling actual method
Around concern Before calling actual method
pnb bank interest rate
Around Concern After calling actual method

Problem Statement 4 : Write a program to demonstrate Spring AOP – after returning advice.

Solution :

Bankaopdata.java

```
package bvimit.edu;

import org.aspectj.lang.JoinPoint;
import org.aspectj.lang.ProceedingJoinPoint;
import org.aspectj.lang.annotation.AfterReturning;
import org.aspectj.lang.annotation.Around;
import org.aspectj.lang.annotation.Aspect;
import org.aspectj.lang.annotation.Pointcut;

@Aspect
public class Bankaopdata {

	@AfterReturning(
			pointcut ="execution(* Bank.*(..))",
			returning="result")
public void myadvice(JoinPoint jp,Object result)
{
	System.out.println("AfterReturning concern");
	System.out.println("Result in advice" +result);
	}
}
```

Bank.java

```
package bvimit.edu;

public class Bank {
	public void welcome() {System.out.println("welcome to bank");}
	public int icici() {System.out.println("icici bank interest rate");return 7;}
	public int pnb() {System.out.println("pnb bank interest rate");return 6;}

}
```

Bankaopdata.xml

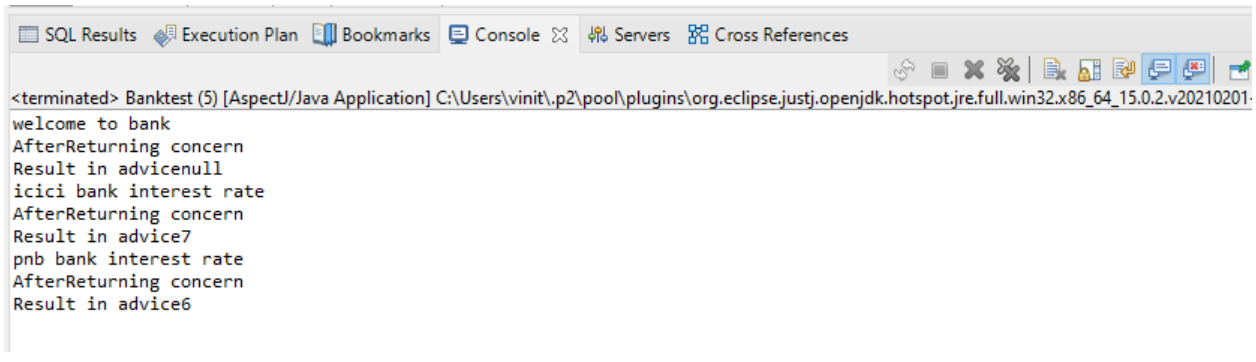
```
<?xml version="1.0" encoding="UTF-8"?>
<beans xmlns="http://www.springframework.org/schema/beans"
	xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
	xsi:schemaLocation="http://www.springframework.org/schema/beans
http://www.springframework.org/schema/beans/spring-beans.xsd">
```

```
<bean id="opBean" class="bvimit.edu.Bank"> </bean>
<bean id="trackMyBean" class="bvimit.edu.Bankaopdata"></bean>

<bean
class="org.springframework.aop.aspectj.annotation.AnnotationAwareAspectJAutoProxyCreator
"></bean>
</beans>
```

Banktest.java

```
package bvimit.edu;

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

public class Banktest {

	private static ApplicationContext context;

	public static void main(String[] args) {
		context = new ClassPathXmlApplicationContext("Bankaopdata.xml");

		Bank e =(Bank) context.getBean("opBean");
		//System.out.println("Calling welcome method...");
		e.welcome();
		//System.out.println("Calling icici method...");
		e.icici();
		//System.out.println("Calling pnb method...");
		e.pnb();
	}

}
```

Output :



Problem Statement 5 : Write a program to demonstrate Spring AOP – after throwing advice.

Solution :

Operationaop_at.java

```
package bvimit.edu;
import org.aspectj.lang.JoinPoint;
import org.aspectj.lang.annotation.AfterThrowing;
import org.aspectj.lang.annotation.Aspect;

@Aspect
public class Operationaop_at {
@AfterThrowing(
                        pointcut = "execution(* Operation_at.*(..))", throwing = "error")
        public void myadvice(JoinPoint jp, Throwable error)
        {
                System.out.println("AfterThrowing concern");
                System.out.println("Exception is: "+error);
                System.out.println("end of after throwing advice....");
        }
        }
```

Operation_at.java

```
package bvimit.edu;
public class Operation_at {

        public void validate(int att)throws Exception{
                if(att<75) {
                        throw new ArithmeticException("Not eligible for exam");
                }
                else {
                        System.out.println("Eligible for exam");
                }
        }
}
```

validctx.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"
        xsi:schemaLocation="http://www.springframework.org/schema/beans
http://www.springframework.org/schema/beans/spring-beans.xsd">


<bean id="opBean" class="bvimit.edu.Operation_at"></bean>

<bean id="trackMyBean" class="bvimit.edu.Operationaop_at"></bean>

<bean
class="org.springframework.aop.aspectj.annotation.AnnotationAwareAspectJAutoProxyCreator
"></bean></beans>
```

TestValidation.java

```
package bvimit.edu;
import org.springframework.context.ApplicationContext;
import org.springframework.context.support.ClassPathXmlApplicationContext;

public class OperationTest_at {
private static ApplicationContext context;
                public static void main(String[] args) {
ApplicationContext context = new ClassPathXmlApplicationContext("validctx.xml");
                        Operation_at op = (Operation_at) context.getBean("opBean");
                        System.out.println("calling validate....");
                        try {
                                op.validate(85);
                        }catch(Exception e){System.out.println(e);}

                        System.out.println("calling validate again....");

                        try {
                                op.validate(25);
                        }catch(Exception e){System.out.println(e);}
```

```
    }
}
```