Experiment Number : 06 **Date: 05-02-26**

ABSTRACT CLASSES

Aim:

To understand and implement inheritance concepts in Java.

PRE LAB EXERCISE

QUESTIONS

- ✓ What is an abstract class?

  Answer: An abstract class is a class that is declared using the abstract keyword and **cannot be instantiated (object cannot be created)**. It may contain **abstract methods (without body)** and **concrete methods (with body)**. It is used as a base class for other classes.

- ✓ Why are abstract methods used?

  Answer: Abstract methods are used to **force child classes to provide their own implementation**. They define *what* a class should do, but not *how* it should do it.

- ✓ Difference between abstract class and interface.

  Answer:

Abstract Class	**Interface**
Uses abstract keyword	Uses interface keyword
Can have method body	Methods are abstract by default
Can have constructors	Cannot have constructors
Can contain variables	Only constants (public static final)
Supports single inheritance	Supports multiple inheritance
Uses extends	Uses implements

IN LAB EXERCISE

Objective:

To implement abstract class and demonstrate abstraction.

PROGRAMS:

1.University System

Scenario:
A university has different types of courses: Online, Offline, and Hybrid. Each course has a getDetails() method.

Question:
Create an abstract class Course with abstract method getDetails(). Implement OnlineCourse, OfflineCourse, and HybridCourse classes.

Code:

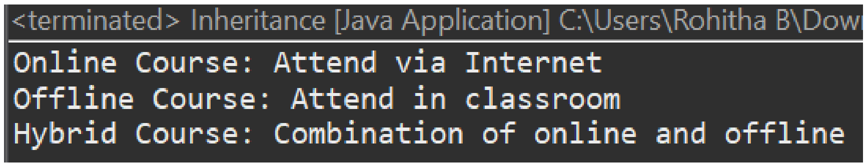
```
abstract class Course {
    abstract void getDetails();
}


class OnlineCourse extends Course {
    void getDetails() {
        System.out.println("Online Course: Attend via Internet");
    }
}


class OfflineCourse extends Course {
    void getDetails() {
        System.out.println("Offline Course: Attend in classroom");
    }
}


class HybridCourse extends Course {
    void getDetails() {
        System.out.println("Hybrid Course: Combination of online and offline");
    }
}

public class Main {
    public static void main(String[] args) {
        Course c1 = new OnlineCourse();
        Course c2 = new OfflineCourse();
        Course c3 = new HybridCourse();

        c1.getDetails();
        c2.getDetails();
        c3.getDetails();
    }
}
```

Output:

Online Course: Attend via Internet

Offline Course: Attend in classroom

Hybrid Course: Combination of online and offline



```
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Online Course: Attend via Internet
Offline Course: Attend in classroom
Hybrid Course: Combination of online and offline
```

2. Employee Payroll System

Scenario:
A company has different types of employees — Regular and Contract. All employees have a salary, but the calculation differs for each type.

Question:
Design an abstract class Employee with an abstract method calculateSalary(). Implement subclasses RegularEmployee and ContractEmployee to calculate salary differently.

Code:

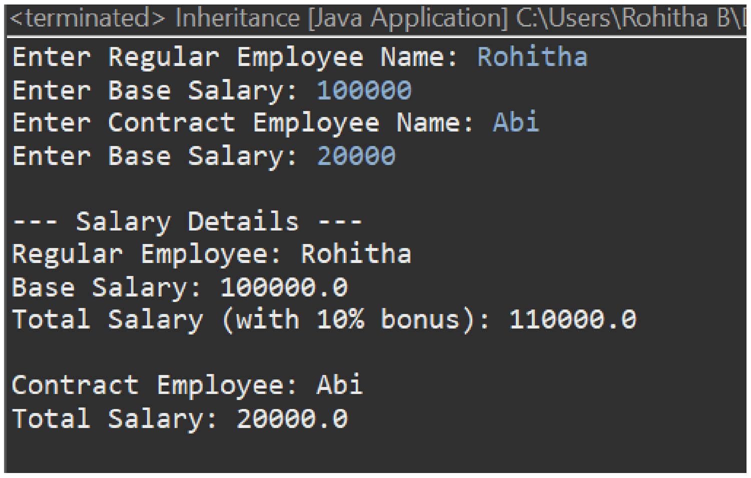
```
import java.util.Scanner;
abstract class Employee {
    String name;
    double baseSalary;

    // Abstract method to calculate total salary
    abstract void calculateSalary();
}

class RegularEmployee extends Employee {
    double bonusRate = 0.1; // 10% bonus

    void calculateSalary() {
        double totalSalary = baseSalary + (baseSalary * bonusRate);
        System.out.println("Regular Employee: " + name);
        System.out.println("Base Salary: " + baseSalary);
        System.out.println("Total Salary (with 10% bonus): " + totalSalary);
    }
}

class ContractEmployee extends Employee {
    void calculateSalary() {
        System.out.println("Contract Employee: " + name);
        System.out.println("Total Salary: " + baseSalary);
    }
}

public class Main {
```

```
public static void main(String[] args) {
    Scanner sc = new Scanner(System.in);

    // Input for Regular Employee
    System.out.print("Enter Regular Employee Name: ");
    String regName = sc.nextLine();
    System.out.print("Enter Base Salary: ");
    double regSalary = sc.nextDouble();
    sc.nextLine(); // Consume newline

    // Input for Contract Employee
    System.out.print("Enter Contract Employee Name: ");
    String conName = sc.nextLine();
    System.out.print("Enter Base Salary: ");
    double conSalary = sc.nextDouble();

    // Create objects
    Employee e1 = new RegularEmployee();
    e1.name = regName;
    e1.baseSalary = regSalary;

    Employee e2 = new ContractEmployee();
    e2.name = conName;
    e2.baseSalary = conSalary;

    System.out.println("\n--- Salary Details ---");
    e1.calculateSalary();
    System.out.println();
```

```
        e2.calculateSalary();

        sc.close();
    }
}
```

Output:

```
Enter Regular Employee Name: Rohitha
Enter Base Salary: 100000
Enter Contract Employee Name: Abi
Enter Base Salary: 20000

--- Salary Details ---
Regular Employee: Rohitha
Base Salary: 100000
Total Salary (with 10% bonus): 110000

Contract Employee: Abi
Total Salary: 20000.0
```



```
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Enter Regular Employee Name: Rohitha
Enter Base Salary: 100000
Enter Contract Employee Name: Abi
Enter Base Salary: 20000

--- Salary Details ---
Regular Employee: Rohitha
Base Salary: 100000.0
Total Salary (with 10% bonus): 110000.0

Contract Employee: Abi
Total Salary: 20000.0
```

3.Banking System

Scenario:

A bank has different types of accounts: Savings and Current. Both accounts need a method to calculate interest, but the calculation differs for each account type.

Question:

Use an abstract class BankAccount with an abstract method calculateInterest() and implement it in SavingsAccount and CurrentAccount classes.

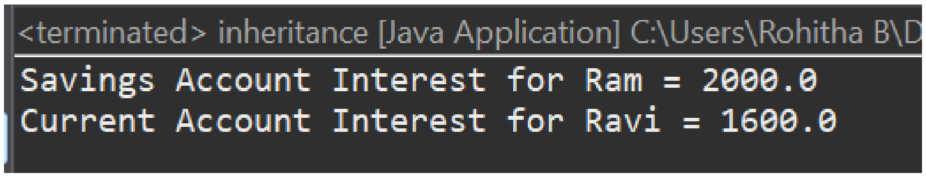
Code

```
abstract class BankAccount {
    String accountHolder;
    double balance;
    BankAccount(String name, double bal) {
        accountHolder = name;
        balance = bal;
    }
    abstract void calculateInterest();  // Abstract method
}
class SavingsAccount extends BankAccount {
    double interestRate = 0.04; // 4% interest

    SavingsAccount(String name, double bal) {
        super(name, bal);
    }
    void calculateInterest() {
        double interest = balance * interestRate;
        System.out.println("Savings Account Interest for " + accountHolder + " = " + interest);
    }
}
```

```
class CurrentAccount extends BankAccount {
    double interestRate = 0.02; // 2% interest

    CurrentAccount(String name, double bal) {
        super(name, bal);
    }
    void calculateInterest() {
        double interest = balance * interestRate;
        System.out.println("Current Account Interest for " + accountHolder + " = " + interest);
    }
}
public class Main {
    public static void main(String[] args) {
        BankAccount acc1 = new SavingsAccount("Ram", 50000);
        BankAccount acc2 = new CurrentAccount("Ravi", 80000);
        acc1.calculateInterest();
        acc2.calculateInterest();
    }
}
```

Output

```
Savings Account Interest for Ram = 2000.0
Current Account Interest for Ravi = 1600.0
```



```
<terminated> inheritance [Java Application] C:\Users\Rohitha B\D
Savings Account Interest for Ram = 2000.0
Current Account Interest for Ravi = 1600.0
```

POST LAB EXERCISE

- ✓ How is an abstract class different from a regular class?

  Answer:

Abstract Class	**Regular Class**
Declared using abstract keyword	Normal class
Cannot create objects	Can create objects
May contain abstract methods	Cannot contain abstract methods
Used for inheritance	Used for direct object creation

- ✓ Can you create an object of an abstract class? Why or why not?

  Answer: No, you **cannot create an object** of an abstract class because it may contain **incomplete (abstract) methods**. It must be inherited and implemented by a subclass.

- ✓ What happens if a subclass does not implement an abstract method?

  Answer: The subclass must also be declared **abstract**. Otherwise, the compiler will generate an error.

- ✓ Can an abstract class exist without any abstract methods?

  Answer: Yes. An abstract class **can exist without abstract methods**. It is used to prevent object creation and provide a base class for inheritance.

- ✓ Can an abstract class extend another abstract class?

  Answer: Yes. An abstract class **can extend another abstract class**, and it may choose to implement or leave abstract methods for further subclasses.

Result:

Thus the abstract classes and methods were implemented and executed successfully.

ASSESSMENT

Description	Max Marks	Marks Awarded
Pre Lab Exercise	**5**	
In Lab Exercise	**10**	
Post Lab Exercise	**5**	
Viva	**10**	
Total	**30**	
Faculty Signature		

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