Experiment Number : 06 **Date: 05.02.2026**

ABSTRACT CLASSES

Aim:

To understand and implement inheritance concepts in Java.

PRE LAB EXERCISE

QUESTIONS

- ✓ What is an abstract class?

  An abstract class is a class that cannot be instantiated and is used as a base for other classes. It is declared using the abstract keyword and may contain both abstract methods (without body) and non-abstract methods (with body). It helps in providing partial implementation while forcing subclasses to complete the remaining methods.

- ✓ Why are abstract methods used?

  Abstract methods are used to define a method structure without providing its implementation. They ensure that subclasses must override and implement these methods. This helps in achieving standardization and method overriding in inheritance.

- ✓ Difference between abstract class and interface.

  An abstract class can have both abstract and concrete methods and can contain instance variables. A class can extend only one abstract class. An interface contains abstract methods by default and supports multiple inheritance through implementation. All variables in an interface are public, static, and final, whereas abstract class variables are not.

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 {
```

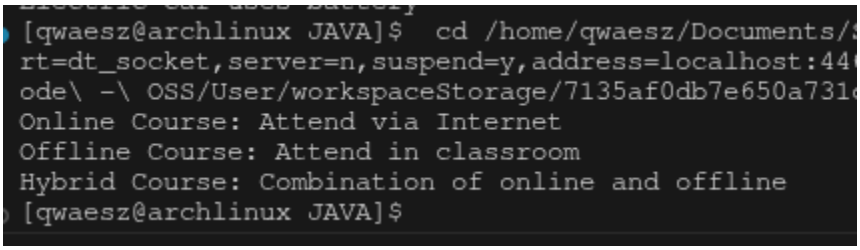
```
    public static void main(String[] args) {
        Course c1 = new OnlineCourse();
        Course c2 = new OfflineCourse();
        Course c3 = new HybridCourse();

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

Output:

Online Course: Attend via Internet

Offline Course: Attend in classroom

Hybrid Course: Combination of online and offline



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: Ram

Enter Base Salary: 30000

Enter Contract Employee Name: Ravi

Enter Base Salary: 20000

--- Salary Details ---

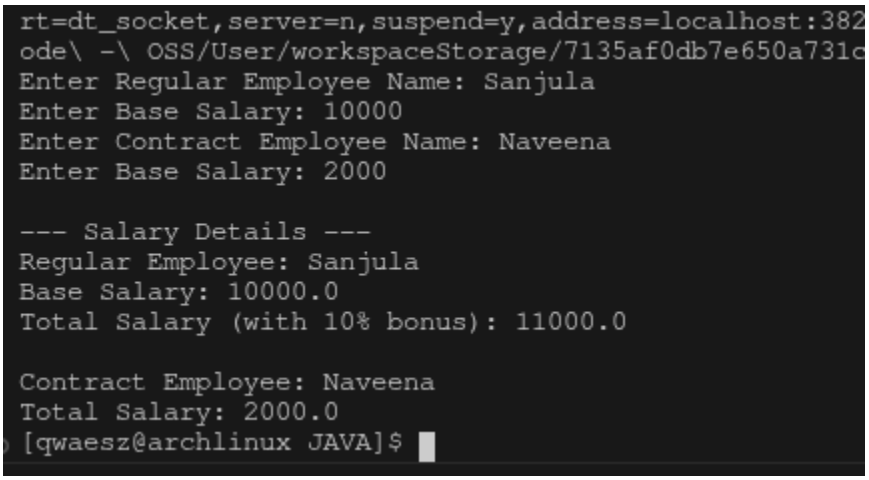
Regular Employee: Anitha

Base Salary: 30000.0

Total Salary (with 10% bonus): 33000.0

Contract Employee: Ravi

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

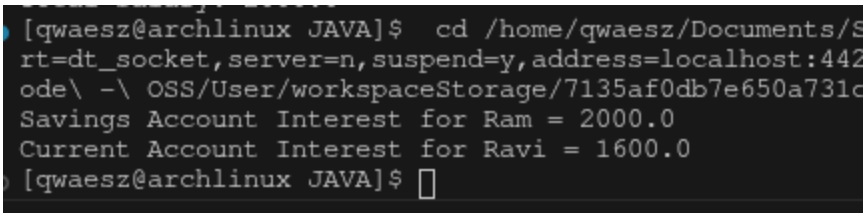
```
abstract class BankAccount {
    String accountHolder;
    double balance;

    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



POST LAB EXERCISE

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

  An abstract class is different from a regular class because it cannot be instantiated and may contain abstract methods without implementation. A regular class can be instantiated and must provide implementation for all its methods. Abstract classes are mainly used for inheritance, while regular classes are used to create objects directly.

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

  No, you cannot create an object of an abstract class because it may contain abstract methods that do not have implementations. Since the behavior is incomplete, Java does not allow object creation of abstract classes.

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

  If a subclass does not implement all the abstract methods of its parent abstract class, then the subclass itself must be declared as abstract. Otherwise, the program will result in a compile-time error.

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

Yes, an abstract class can exist without any abstract methods. Declaring a class as abstract prevents object creation and allows it to be used only as a base class for inheritance.

- ✓ Can an abstract class extend another abstract class?

  Yes, an abstract class can extend another abstract class. The child abstract class may choose to implement the abstract methods of the parent class or leave them unimplemented for its 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	