VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.

LAB REPORT
on

Object Oriented Java Programming

(23CS3PCOOJ)

Submitted by

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in partial fulfillment for the award of the degree of
BACHELOR OF ENGINEERING
in
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Department of Computer Science and Engineering

CERTIFICATE

This is to certify that the Lab work entitled "Object Oriented Java Programming (23CS3PCOOJ)" carried out by **Divya M Mandi (1BM24IC019 - COB),** who is bonafide student of **B.M.S. College of Engineering.** It is in partial fulfilment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum. The Lab report has been approved as it satisfies the academic requirements in respect of an Object-Oriented Java Programming (23CS3PCOOJ) work prescribed for the said degree.

Dr. Seema Patil Associate Professor Department of CSE, BMSCE	Dr. Kavitha Sooda Professor & HOD Department of CSE, BMSCE

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Github Link:

Program 1
Implement Quadratic Equation

Code:
```java
import java.util.Scanner;
public class Lab1 {
    public static void main(String[] args) {
        int a,b,c;
        double r1,r2;
        Scanner in=new Scanner(System.in);
        System.out.println("Enter the value of a, b and c");
        a=in.nextInt();
        b=in.nextInt();
        c=in.nextInt();
        if (a==0) {
            System.out.println("Not a quadratic equation. Enter a non-zero value for
a: ");
            a=in.nextInt();
        }
        float d=(b*b)-(4*a*c);
        if (d==0){
            r1=(-b)/(2*a);
            System.out.println("Roots are real and equal");
            System.out.println("Root 1 = "+r1+" Root 2 = "+r1);
        }
        else if(d>0){
            r1=((-b)+(Math.sqrt(d)))/(double)(2*a);
            r2=((-b)-(Math.sqrt(d)))/(double)(2*a);
            System.out.println("Roots are real and distinct");
            System.out.println("Root 1 = "+r1+" Root 2 = "+r2);
        }
        else{
            r1=(-b)/(2*a);
            r2=Math.sqrt(-d)/(2*a);
            System.out.println("Roots are imaginary");
            System.out.println("Root 1 = "+r1+"+"+r2+"i");
            System.out.println("Root 2 = "+r1+"-"+r2+"i");
        }
    }
}
```

Output:

```
C:\Users\12345\Documents\java programs>javac Lab1.java

C:\Users\12345\Documents\java programs>java Lab1
Enter the value of a, b and c
1 2 1
Roots are real and equal
Root 1 = -1.0 Root 2 = -1.0
```

Program 2
SGPA Calculator

Code:

```java
import java.util.Scanner;
class Subject{
    int subjectMarks;
    int credits;
    int grade;
}
class Student{
    String name,usn;
    double sgpa;
    Scanner s;
    Subject[] subject;
    Student(){
        s=new Scanner(System.in);
        subject=new Subject[8];
        for(int i=0;i<subject.length;i++)
          subject[i]=new Subject();
    }
    void getStudentDetails(){
        System.out.println("Enter student name: ");
        name=s.nextLine();
        System.out.println("Enter USN: ");
        usn=s.nextLine();
    }
    void getMarks(){
        for(int i=0;i<subject.length;i++){
            while(true){
                System.out.print("Enter marks for subject "+(i+1)+" : ");
                subject[i].subjectMarks=s.nextInt();
                if(subject[i].subjectMarks>=0 && subject[i].subjectMarks<=100){
                    break;
                }
                System.out.println("Invalid Marks");
            }
            System.out.print("Enter credits for subject "+(i+1)+" : ");
            subject[i].credits=s.nextInt();
            subject[i].grade = (subject[i].subjectMarks/10) + 1;
            if(subject[i].grade==1) subject[i].grade=10;
            if(subject[i].grade<=4) subject[i].grade=0;
        }
    }
    void computeSGPA(){
        int effectiveScore=0,totalCredits=0;
```

```java
        for(int i=0;i<subject.length;i++){
            effectiveScore+=(subject[i].grade*subject[i].credits);
            totalCredits+=subject[i].credits;
            sgpa=(double)effectiveScore/(double)totalCredits;
        }
    }
    void display(){
        System.out.println("Name: "+name);
        System.out.println("USN: "+usn);
        System.out.println("SGPA: "+sgpa);
    }
}
public class Lab2 {
    public static void main(String[] args) {
        Student stud=new Student();
        stud.getStudentDetails();;
        stud.getMarks();
        stud.computeSGPA();
        stud.display();
    }
}
```

Output:

```
Enter student name:
John
Enter USN:
1BM24CS123
Enter marks for subject 1 : 90
Enter credits for subject 1 : 4
Enter marks for subject 2 : 85
Enter credits for subject 2 : 3
Enter marks for subject 3 : 70
Enter credits for subject 3 : 1
Enter marks for subject 4 : 75
Enter credits for subject 4 : 4
Enter marks for subject 5 : 80
Enter credits for subject 5 : 2
Enter marks for subject 6 : 60
Enter credits for subject 6 : 2
Enter marks for subject 7 : 80
Enter credits for subject 7 : 1
Enter marks for subject 8 : 75
Enter credits for subject 8 : 3
Name: John
USN: 1BM24CS123
SGPA: 8.6
```

Program 3
Book Program with toString() method

Code:
```java
import java.util.Scanner;
class Books{
    String name,author;
    int price, numPages;
    Books(String name,String author,int price,int numPages){
        this.name=name;
        this.author=author;
        this.price=price;
        this.numPages=numPages;
    }
    public String toString(){
        String name,author,price,numPages;
        name="Book name: "+this.name+"\n";
        author="Author name: "+this.author+"\n";
        price="Price: "+this.price+"\n";
        numPages="Number of pages: "+this.numPages+"\n";
        return name+author+price+numPages;
}
}
public class Lab3 {
    public static void main(String[] args) {
        Scanner s=new Scanner(System.in);
        int n,price,numPages;
        String name,author;
        System.out.print("Enter number of books: ");
        n=s.nextInt();
        Books b[];
        b=new Books[n];
        for(int i=0;i<n;i++){
            System.out.print("Enter book name for book "+(i+1)+": ");
            name=s.next();
            System.out.print("Enter author name for book "+(i+1)+": ");
            author=s.next();
            System.out.print("Enter price for book "+(i+1)+": ");
            price=s.nextInt();
            System.out.print("Enter no. of pages of book "+(i+1)+": ");
            numPages=s.nextInt();
            b[i]=new Books(name,author,price,numPages);
        }
        for(int i=0;i<n;i++){
```

```java
            System.out.println(b[i]);
        }
    }
}
```

Output:

```
Enter number of books: 2
Enter book name for book 1: Java
Enter author name for book 1: John
Enter price for book 1: 150
Enter no. of pages of book 1: 200
Enter book name for book 2: C++
Enter author name for book 2: Amy
Enter price for book 2: 200
Enter no. of pages of book 2: 500
Book name: Java
Author name: John
Price: 150
Number of pages: 200

Book name: C++
Author name: Amy
Price: 200
Number of pages: 500
```

Program 4

Abstract class shape and calculate area of triangle, rectangle and circle.

Code:

```java
import java.util.Scanner;
class InputScanner{
    Scanner s=new Scanner(System.in);
}
abstract class Shape extends InputScanner{
    int a,b;
    abstract void printArea();
}
class Rectangle extends Shape{
    void input(){
        System.out.println("Enter length and breadth of rectangle: ");
        a=s.nextInt();
        b=s.nextInt();
    }
    void printArea(){
        System.out.println("Area = "+(a*b));
    }
}
class Triangle extends Shape{
    void input(){
        System.out.println("Enter base and height of triangle: ");
        a=s.nextInt();
        b=s.nextInt();
    }
    void printArea(){
        System.out.println("Area = "+(0.5*a*b));
    }
}
class Circle extends Shape{
    void input(){
        System.out.println("Enter radius of circle: ");
        a=s.nextInt();
    }
    void printArea(){
        System.out.println("Area = "+(3.14*a*a));
    }
}
public class Lab4 {
    public static void main(String[] args) {
        Rectangle r=new Rectangle();
```

```
        Triangle t=new Triangle();
        Circle c=new Circle();
        r.input();
        r.printArea();
        t.input();
        t.printArea();
        c.input();
        c.printArea();
    }
}
```

Output:

```
Enter length and breadth of rectangle:
3 4
Area = 12
Enter base and height of triangle:
5 9
Area = 22.5
Enter radius of circle:
7
Area = 153.86
```

Program 5
Create class Bank with two subclasses Savacct and Curract

Code:
```java
import java.util.Scanner;
class Account {
    String customerName;
    int accountNumber;
    String accountType;
    double balance;
    Account(String name, int number, String type) {
        customerName = name;
        accountNumber = number;
        accountType = type;
        balance = 0.0;
    }
    void deposit(double amount) {
        balance += amount;
        System.out.println("Deposit successful");
    }
    void withdraw(double amount) {
        if (balance >= amount) {
            balance -= amount;
            System.out.println("Withdrawal successful");
        }
        else
            System.out.println("Insufficient balance");
    }
    void displayAccount() {
        System.out.println("Customer name: " + customerName);
        System.out.println("Account number: " + accountNumber);
        System.out.println("Type of Account: " + accountType);
        System.out.println("Account Balance: " + balance);
    }
}
class Savacct extends Account {
    Savacct(String name, int number) {
        super(name, number, "saving");
    }
    void computeInterest() {
        double rate = 0.05;
        double interest = balance * rate;
        balance += interest;
        System.out.println("Interest " + interest + " added");
        System.out.println("Updated balance: " + balance);
        System.out.println();
```

```java
    }
}
class Curracct extends Account{
    double minBalance = 1000;
    double serviceCharge = 100;
    Curracct(String name,int number){
        super(name,number,"current");
    }
    void withdraw(double amount) {
        if (balance >= amount) {
            balance -= amount;
            checkMinBalance();
        }
        else
            System.out.println("Insufficient balance");
    }
    void checkMinBalance() {
        if (balance < minBalance) {
            System.out.println("Balance below minimum. Penalty applied: " +
serviceCharge);
            balance -= serviceCharge;
            if (balance < 0) balance = 0;
            System.out.println("Updated balance after penalty: " + balance);
        }
        else {
            System.out.println("Minimum balance maintained.");
        }
    }
}
public class Lab5 {
    public static void main(String[] args) {
    Scanner sc = new Scanner(System.in);
    System.out.print("Enter customer name: ");
    String name1 = sc.nextLine();
    System.out.print("Enter account number: ");
    int acc1 = sc.nextInt();
    sc.nextLine();
    System.out.print("Enter customer name: ");
    String name2 = sc.nextLine();
    System.out.print("Enter account number: ");
    int acc2 = sc.nextInt();
    sc.nextLine();
    Savacct s1 = new Savacct(name1,acc1);
    Curracct c1 = new Curracct(name2,acc2);
    int choice;
    do {
```

```java
        System.out.println("\n-----MENU------");
        System.out.println("1. Deposit");
        System.out.println("2. Withdraw");
        System.out.println("3. Compute Interest for Savings Account");
        System.out.println("4. Display Account Details");
        System.out.println("5. Exit");
        System.out.print("Enter your choice: ");
        choice = sc.nextInt();
        sc.nextLine();
        switch (choice) {
            case 1:
                System.out.print("Enter the type of account (saving/current): ");
                String t1 = sc.nextLine().toLowerCase();
                System.out.print("Enter the deposit amount: ");
                double d = sc.nextDouble();
                if (t1.equals("saving")) {
                    s1.deposit(d);
                    s1.displayAccount();
                }
                else {
                    c1.deposit(d);
                    c1.displayAccount();
                }
                break;
            case 2:
                System.out.print("Enter the type of account (saving/current): ");
                String t2 = sc.nextLine().toLowerCase();
                System.out.print("Enter the withdrawal amount: ");
                double w = sc.nextDouble();
                if (t2.equals("saving")) {
                    s1.withdraw(w);
                    s1.displayAccount();
                }
                else {
                    c1.withdraw(w);
                    c1.displayAccount();
                }
                break;
            case 3:
                System.out.print("Enter the type of account (saving/current): ");
                String t3 = sc.nextLine().toLowerCase();
                if (t3.equals("saving")) s1.computeInterest();
                else System.out.println("Current account has no interest.");
                break;
            case 4:
                System.out.print("Enter the type of account (saving/current): ");
```

```java
                String t4 = sc.nextLine().toLowerCase();
                if (t4.equals("saving")) s1.displayAccount();
                else c1.displayAccount();
                break;
            case 5:
                System.out.println("Exiting...");
                break;
            default:
                System.out.println("Invalid choice");
        }
    } while (choice != 5);
    sc.close();
}
}
```

Output:

```
Enter customer name: Alice
Enter account number: 101
Enter customer name: John
Enter account number: 202

-----MENU------
1. Deposit
2. Withdraw
3. Compute Interest for Savings Account
4. Display Account Details
5. Exit
Enter your choice: 1
Enter the type of account (saving/current): saving
Enter the deposit amount: 2000
Deposit successful
Customer name: Alice
Account number: 101
Type of Account: saving
Account Balance: 2000.0

-----MENU------
1. Deposit
2. Withdraw
3. Compute Interest for Savings Account
4. Display Account Details
5. Exit
Enter your choice: 1
Enter the type of account (saving/current): current
Enter the deposit amount: 1000
Deposit successful
Customer name: John
Account number: 202
Type of Account: current
Account Balance: 1000.0
```

```
-----MENU------
1. Deposit
2. Withdraw
3. Compute Interest for Savings Account
4. Display Account Details
5. Exit
Enter your choice: 3
Enter the type of account (saving/current): saving
Interest 100.0 added
Updated balance: 2100.0


-----MENU------
1. Deposit
2. Withdraw
3. Compute Interest for Savings Account
4. Display Account Details
5. Exit
Enter your choice: 5
Exiting...
```

Program 6
Create two packages CIE and SEE and calculate final marks of 5 courses

Code:

Package CIE
```java
package CIE;
import java.util.Scanner;
public class Student{
    protected String usn=new String();
    protected String name =new String();
    protected int sem;
    public void inputStudentDetails(){
        Scanner s=new Scanner(System.in);
        System.out.println("Enter student name, USN and sem: ");
        name=s.next();
        usn=s.next();
        sem=s.nextInt();
    }
    public void displayStudentDetails(){
        System.out.println("Name: "+name);
        System.out.println("USN: "+usn);
        System.out.println("Sem: "+sem);
    }
}
```

```java
package CIE;
import java.util.Scanner;
public class Internals extends Student{
    protected int cieMarks[]=new int[5];
    public void inputCIEmarks(){
        Scanner s=new Scanner(System.in);
        for(int i=0;i<5;i++){
            System.out.print("Enter CIE marks for subject "+(i+1)+": ");
            cieMarks[i]=s.nextInt();
        }
    }
}
```

Package SEE

```java
package SEE;
import CIE.Internals;
import java.util.Scanner;
public class Externals extends Internals{
    protected int seeMarks[]=new int[5];
    protected int finalMarks[]=new int[5];
    public void inputSEEmarks(){
        Scanner s=new Scanner(System.in);
        for(int i=0;i<5;i++){
            System.out.print("Enter SEE marks for subject "+(i+1)+": ");
            seeMarks[i]=s.nextInt();
        }
    }
    public void calculateFinalMarks(){
        for(int i=0;i<5;i++){
            finalMarks[i]=seeMarks[i]+cieMarks[i];
        }
    }
    public void displayFinalMarks(){
        System.out.println("---Final Marks---");
        for(int i=0;i<5;i++){
            System.out.println("Subject "+(i+1)+": "+finalMarks[i]);
        }
```

Main

```java
import SEE.Externals;
import java.util.Scanner;
public class Lab6 {
    public static void main(String[] args) {
        Scanner s=new Scanner(System.in);
        System.out.println("Enter no. of students: ");
        int n=s.nextInt();
        Externals[] students=new Externals[n];
        for(int i=0;i<n;i++){
            System.out.println("Enter details of student "+(i+1)+": ");
            students[i]=new Externals();
            students[i].inputStudentDetails();
            students[i].inputCIEmarks();
            students[i].inputSEEmarks();
            students[i].calculateFinalMarks();
        }
        for(int i=0;i<n;i++){
            System.out.println("\nStudent "+(i+1));
```

```
            students[i].displayFinalMarks();
        }
    }
}
```

Output:

```
Enter no. of students:
1
Enter details of student 1:
Enter student name, USN and sem:
Alice
1BM24CS100
3
Enter CIE marks for subject 1: 40
Enter CIE marks for subject 2: 40
Enter CIE marks for subject 3: 50
Enter CIE marks for subject 4: 35
Enter CIE marks for subject 5: 40
Enter SEE marks for subject 1: 35
Enter SEE marks for subject 2: 45
Enter SEE marks for subject 3: 48
Enter SEE marks for subject 4: 40
Enter SEE marks for subject 5: 35

Student 1
---Final Marks---
Subject 1: 75
Subject 2: 85
Subject 3: 98
Subject 4: 75
Subject 5: 75
```

Program 7
Exceptions: Son's age must not be greater than father's age.

Code:
```java
import java.util.Scanner;
class WrongAge extends Exception{
    WrongAge(){
        super("Error Message");
    }
    WrongAge(String msg){
        super(msg);
    }
}
class inputScanner{
    Scanner s=new Scanner(System.in);;
}
class Father extends inputScanner{
    int fatherAge;
    Father() throws WrongAge{
        System.out.println("Enter father's age: ");
        fatherAge=s.nextInt();
        if(fatherAge<0)
            throw new WrongAge("Age cannot be negative");
    }
    public void display(){
        System.out.println("Father Age = "+fatherAge);
    }
}
class Son extends Father{
    int sonAge;
    Son() throws WrongAge{
        System.out.println("Enter son's age: ");
        sonAge=s.nextInt();
        if(sonAge>fatherAge){
            throw new WrongAge("Sons's age cannot be greater than father's age");
        }
        else if(sonAge<0){
            throw new WrongAge("Age cannot be negative");
        }
    }
    public void display(){
        System.out.println("Son's Age = "+sonAge);
    }
}
```

```
public class lab7 {
    public static void main(String[] args){
        try{
            Son s=new Son();
            s.display();
            Father f=new Father();
            f.display();
        }
        catch(WrongAge e){
            System.out.println("Error: "+e.getMessage());
        }
    }
}
```

Output:

```
Enter father's age:
40
Enter son's age:
90
Error: Sons's age cannot be greater than father's age
```

Program 8

Multithreading: Display "CSE" every 2 seconds, "BMS College of Engineering" every 10 seconds.

Code:

```java
class BMS extends Thread{
    public void run(){
        try{
            for(int i=1;i<=5;i++){
            System.out.println("BMS college of Engineering: "+i);
            Thread.sleep(10000);
            }
        }
        catch(InterruptedException ie){
            System.out.println("BMS Thread quitting");
        }
    }
}
class CSE extends Thread{
    public void run(){
        try{
            for(int i=1;i<=5;i++){
            System.out.println("CSE: "+i);
            Thread.sleep(2000);
            }
        }
        catch(InterruptedException ie){
            System.out.println("CSE Thread quitting");
        }
    }
}
public class Lab8 {
    public static void main(String args[]) {
        BMS b=new BMS();
        CSE c=new CSE();
        b.start();
        c.start();
    }
}
```

Output:

```
BMS college of Engineering: 1
CSE: 1
CSE: 2
CSE: 3
CSE: 4
CSE: 5
BMS college of Engineering: 2
BMS college of Engineering: 3
BMS college of Engineering: 4
BMS college of Engineering: 5
```