VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.

LAB REPORT
on

Object Oriented Java Programming

(23CS3PCOOJ)

Submitted by

Suddala Sanjusha (1BF24CS302)

in partial fulfillment for the award of the degree of
BACHELOR OF ENGINEERING
in

B.M.S. COLLEGE OF ENGINEERING
(Autonomous Institution under VTU)
BENGALURU-560019
Aug-2025 to Jan-2026

B.M.S. College of Engineering,
Bull Temple Road, Bangalore 560019
(Affiliated To Visvesvaraya Technological University, Belgaum)
Department of Computer Science and Engineering

CERTIFICATE

This is to certify that the Lab work entitled "Object Oriented Java Programming (23CS3PCOOJ)" carried out by **Suddala Sanjusha(1BF24CS302),** 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:
https://github.com/suddalasanjushacs24-glitch/OOJ

Program 1

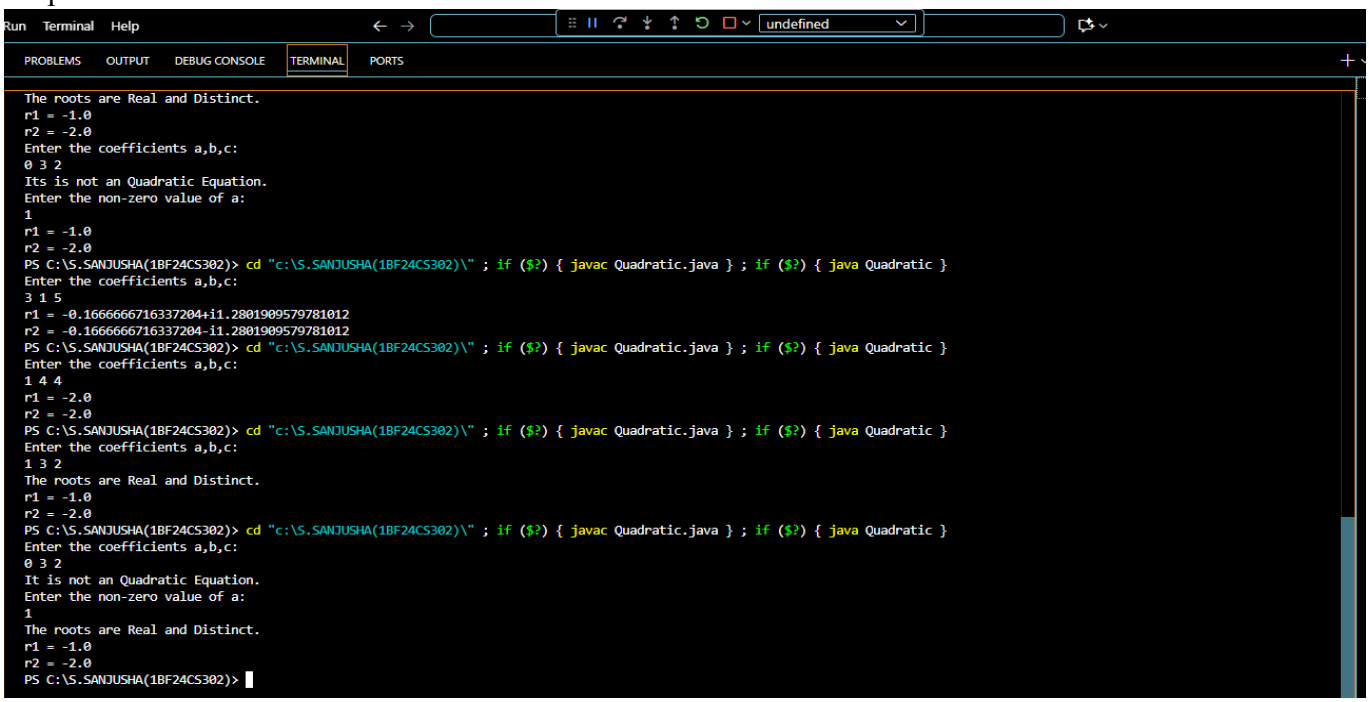
Develop a Java program that prints all real solutions to the quadratic equation ax2+bx+c = 0. Read in a, b, c and use the quadratic formula. If the discriminate b2-4ac is negative, display a message stating that there are no real solutions.

Code:

```
import java.util.Scanner;
class Quadratic{
    public static void main(String args[]){
        float a,b,c,d;
        double r1,r2;
        Scanner in = new Scanner(System.in);

        System.out.println("Enter the coefficients a,b,c:");
        a = in.nextFloat();
        b = in.nextFloat();
        c = in.nextFloat();

        if (a==0){
            System.out.println("It is not an Quadratic Equation.");
            System.out.println("Enter the non-zero value of a:");
            a = in.nextFloat();
        }

        d = b*b - 4*a*c;
        if (d==0){
            System.out.println("The roots are Real and Equal.");
            r1 = r2 = (-b)/(2*a);
            System.out.println("r1 = "+r1);
            System.out.println("r2 = "+r2);
        }
        else if (d>0){
            System.out.println("The roots are Real and Distinct.");
            r1 = ((-b) + (Math.sqrt(d)))/(double)(2*a);
            r2 = ((-b) - (Math.sqrt(d)))/(double)(2*a);
            System.out.println("r1 = "+r1);
            System.out.println("r2 = "+r2);
        }
```

```
        else if (d<0){
            System.out.println("The roots are Imaginary.");
            r1 = (-b)/(2*a);
            r2 = (Math.sqrt(-d))/(2*a);
            System.out.println("r1 = "+r1 + "+i" + r2);
            System.out.println("r2 = "+r1 + "-i" + r2);
        }
    }
}
```

Output:



Program 2

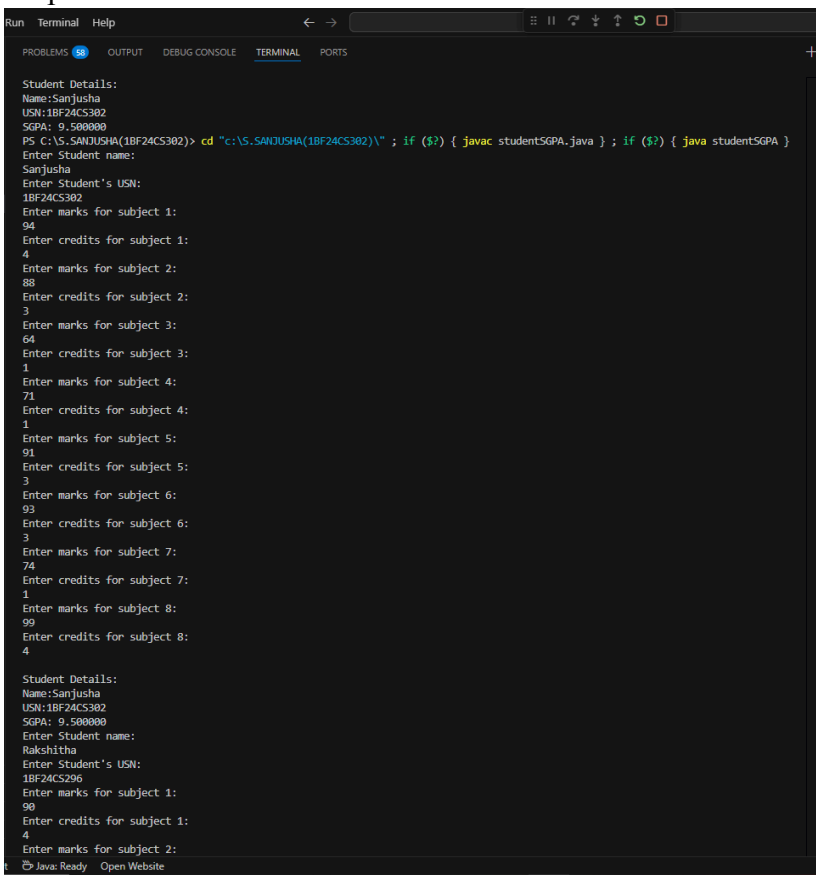
Develop a Java program to create a class Student with members usn, name, an array credits and an array marks. Include methods to accept and display details and a method to calculate SGPA of a student.

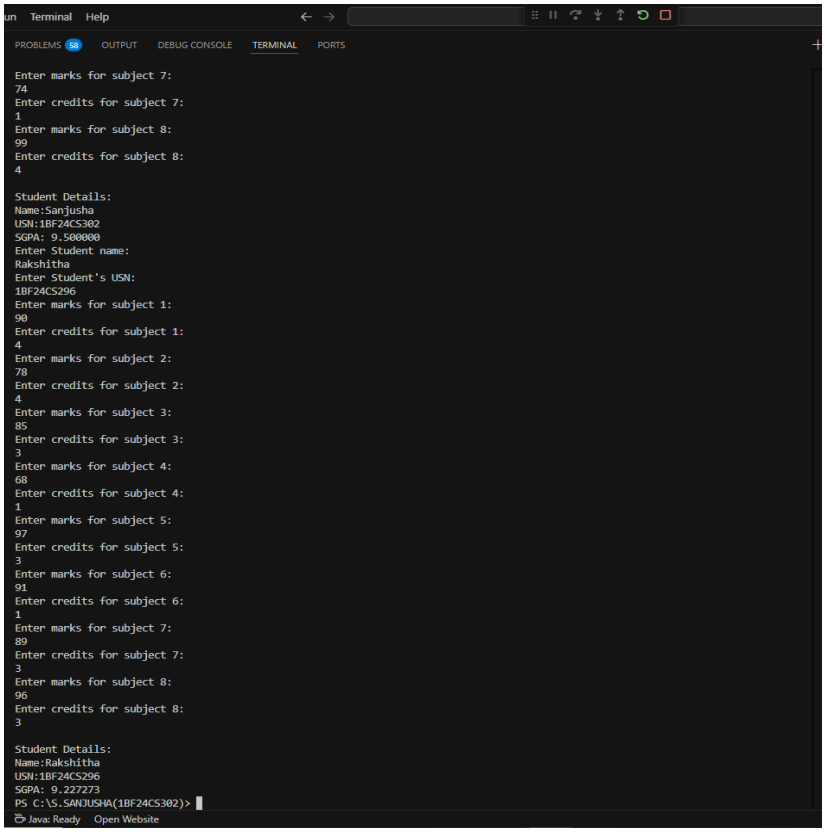
Code:

```
import java.util.Scanner;
class Subject{
    int subjectMarks, credits, grade;
}

class Student{
    String name;
    String usn;
    double SGPA;
    Scanner s;
    Subject subject[];

    Student(){
        s = new Scanner(System.in);
        subject = new Subject[8];
        for (int i=0; i<8; i++){
            subject[i] = new Subject();
        }
    }

    void getStudentDetails(){
        System.out.println("Enter Student name:");
        name = s.nextLine();
        System.out.println("Enter Student's USN:");
        usn = s.nextLine();
    }

    void getMarks(){
        for(int i=0; i<8; i++){
            System.out.println("Enter marks for subject " + (i+1) + ":");
            subject[i].subjectMarks = s.nextInt();
            System.out.println("Enter credits for subject " + (i+1) +":");
            subject[i].credits = s.nextInt();
            subject[i].grade = (subject[i].subjectMarks/10) + 1;
            if (subject[i].grade == 11){
```

```
                subject[i].grade = 10;
            }
            else if (subject[i].grade<=4){
                subject[i].grade = 0;
            }
        }
    }

    void computeSGPA(){
        int Score =0;
        int totalCredits = 0;
        for (int i=0; i<8; i++){
            Score += (subject[i].grade*subject[i].credits);
            totalCredits += subject[i].credits;
        }
        SGPA = (double)Score/(double)totalCredits;
    }

    void display(){
        System.out.println("\nStudent Details:");
        System.out.println("Name:" + name);
        System.out.println("USN:" + usn);
        System.out.printf("SGPA: %2f\n",SGPA);
    }
}

class studentSGPA{
    public static void main (String args[]){
        for (int i=0; i<2; i++){
            Student student = new Student();
            student.getStudentDetails();
            student.getMarks();
            student.computeSGPA();
            student.display();
        }
    }
}
```

Output:


Run Terminal Help
PROBLEMS 58 OUTPUT DEBUG CONSOLE TERMINAL PORTS
Student Details:
Name:Sanjusha
USN:1BF24CS302
SGPA: 9.500000
PS C:\S.SANJUSHA(1BF24CS302)> cd "c:\S.SANJUSHA(1BF24CS302)\" ; if ($?) { javac studentSGPA.java } ; if ($?) { java studentSGPA }
Enter Student name:
Sanjusha
Enter Student's USN:
1BF24CS302
Enter marks for subject 1:
94
Enter credits for subject 1:
4
Enter marks for subject 2:
88
Enter credits for subject 2:
3
Enter marks for subject 3:
64
Enter credits for subject 3:
1
Enter marks for subject 4:
71
Enter credits for subject 4:
1
Enter marks for subject 5:
91
Enter credits for subject 5:
3
Enter marks for subject 6:
93
Enter credits for subject 6:
3
Enter marks for subject 7:
74
Enter credits for subject 7:
1
Enter marks for subject 8:
99
Enter credits for subject 8:
4
Student Details:
Name:Sanjusha
USN:1BF24CS302
SGPA: 9.500000
Enter Student name:
Rakshitha
Enter Student's USN:
1BF24CS296
Enter marks for subject 1:
90
Enter credits for subject 1:
4
Enter marks for subject 2:
Java: Ready
Open Website



Program 3

Create a class Book which contains four members: name, author, price, num_pages. Include a constructor to set the values for the members. Include methods to set and get the details of the objects. Include a toString( ) method that could display the complete details of the book. Develop a Java program to create n book objects.

Code:

```
import java.util.Scanner;
class Books{
    String name, author;
    int price;
    int 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 books {
    public static void main (String args[]){
        Scanner s = new Scanner(System.in);
        int n, price, numPages;
        String name, author;
        n = s.nextInt();
        Books b[];
        b = new Books[n];
        for (int i=0; i<n; i++){
            System.out.println("Enter book name:");
            name = s.nextLine();
            System.out.println("Enter author's name:");
            author = s.nextLine();
            System.out.println("Enter price:");
            price = s.nextInt();
            System.out.println("Enter no. of pages in book:");
            numPages = s.nextInt();
            b[i] = new Books(name, author,price, numPages);
            System.out.println(b[i].toString());
        }
        s.close();
    }
}
```

Output:

Program 4

Develop a Java program to create an abstract class named Shape that contains two integers and an empty method named printArea( ). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contain only the method printArea( ) that prints the area of the given shape.

Code:

```
import java.util.Scanner;
class inputScanner{
    Scanner sc = new Scanner(System.in);
}

abstract class shape extends inputScanner{
    int dim1, dim2;
    abstract void input();
    abstract void printArea();
}

class rectangle extends shape{
    void input(){
        System.out.println("Enter length, breadth:");
        dim1 = sc.nextInt();
        dim2 = sc.nextInt();
```

```
    }
    void printArea(){
        double area;
        area = (double) dim1*dim2;
        System.out.println("Area of Rectangle: " +area);
    }
}

class triangle extends shape{
    void input(){
        System.out.println("Enter base, height:");
        dim1 = sc.nextInt();
        dim2 = sc.nextInt();
    }
    void printArea(){
        double area;
        area = (double) 0.5*dim1*dim2;
        System.out.println("Area of Triangle: " +area);
    }
}

class circle extends shape{
    void input(){
        System.out.println("Enter radius:");
        dim1 = sc.nextInt();
    }
    void printArea(){
        double area;
        area = (double) 3.14*dim1*dim1;
        System.out.println("Area of Circle: " +area);
    }
}

public class Mainclass{
    public static void main(String args[]){
        rectangle r = new rectangle();
        r.input();
        triangle t = new triangle();
        t.input();
        circle c = new circle();
```

```
        c.input();
        r.printArea();
        t.printArea();
        c.printArea();
    }
}
```

Output:

```
InExceptionMessages' '-cp' 'C:\Users\DELL\AppData\Roaming\Code\User\workspaceStorage\cd21398c057bd203328f08
83cd86c070\redhat.java\jdt_ws\OOJ_2379539b\bin' 'Mainclass'
Enter length, breadth:
5
6
Enter base, height:
8
5
Enter radius:
7
Area of Rectangle: 30.0
Area of Triangle: 20.0
Area of Circle: 153.86
PS C:\Users\DELL\OneDrive\Desktop\OOJ>
```

Program 5

Develop a Java program to create a class Bank that maintains two kinds of account for its customers, one called savings account and the other current account. The savings account provides compound interest and withdrawal facilities but no cheque book facility. The current account provides cheque book facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below this level, a service charge is imposed.

Code:

```
import java.util.Scanner;
class Account {
    String name,type;
    int accNo;
    double balance;

    void account(String n, int no, String t) {
        name = n;
        accNo = no;
        type = t;
        balance = 0.0;
    }
```

```
    void deposit(double amt) {
        balance += amt;
        System.out.println("Amount deposited.");
    }

    void display() {
        System.out.println("Customer: " + name);
        System.out.println("Account No: " + accNo);
        System.out.println("Type: " + type);
        System.out.println("Balance: " + balance);
    }
}

class Savings extends Account {
    void interest() {
        double i = balance * 0.05;
        balance += i;
        System.out.println("Interest added: " + i);
    }

    void withdraw(double amt) {
        if (amt <= balance)
             balance -= amt;
        else
            System.out.println("Insufficient balance!");
    }
}

class Current extends Account {
    void withdraw(double amt) {
        balance -= amt;
        if (balance < 500) {
            balance -= 50;
            System.out.println("Service charge imposed.");
        }
    }
}

public class bankaccount{
    public static void main(String[] args) {
```

```
        Scanner sc = new Scanner(System.in);
        Savings s = new Savings();
        Current c = new Current();

        System.out.print("Enter customer name for savings acc: ");
        String n1 = sc.next();
        System.out.print("Enter  savings account number: ");
        int a1 = sc.nextInt();
        s.account(n1, a1, "Savings");

        System.out.print("Enter customer name for current account: ");
        String n2 = sc.next();
        System.out.print("Enter current account number: ");
        int a2 = sc.nextInt();
        c.account(n2, a2, "Current");

        int ch;
        do {
            System.out.println("\n1.Deposit  2.Withdraw  3.Interest
4.Display  5.Exit");
            System.out.print("Enter choice: ");
            ch = sc.nextInt();
            switch (ch) {
                case 1 -> {
                    System.out.print("Account type (saving/current): ");
                    String t = sc.next();
                    System.out.print("Amount: ");
                    double d = sc.nextDouble();
                    if (t.equalsIgnoreCase("saving"))
                        s.deposit(d);
                    else
                        c.deposit(d);
                }
                case 2 -> {
                    System.out.print("Account type (saving/current): ");
                    String t = sc.next();
                    System.out.print("Amount: ");
                    double w = sc.nextDouble();
                    if (t.equalsIgnoreCase("saving"))
                        s.withdraw(w);
```

```
                    else
                        c.withdraw(w);
                }
                case 3 -> s.interest();
                case 4 -> {
                    System.out.print("Account type (saving/current): ");
                    String t = sc.next();
                    if (t.equalsIgnoreCase("saving"))
                        s.display();
                    else
                        c.display();
                }
                case 5 -> System.out.println("Thank you!");
                default -> System.out.println("Invalid choice!");
            }
        } while (ch != 5);
        sc.close();
    }
}
```

Output:

```
Enter customer name for savings acc: RAJU
Enter  savings account number: 12345
Enter customer name for current account: SITA
Enter current account number: 67890

1.Deposit  2.Withdraw  3.Interest  4.Display  5.Exit
Enter choice: 1
Account type (saving/current): SAVING
Amount: 10000
Amount deposited.

1.Deposit  2.Withdraw  3.Interest  4.Display  5.Exit
Enter choice: 2
Account type (saving/current): SAVING
Amount: 2000

1.Deposit  2.Withdraw  3.Interest  4.Display  5.Exit
Enter choice: 3
Interest added: 400.0

1.Deposit  2.Withdraw  3.Interest  4.Display  5.Exit
Enter choice: 4
Account type (saving/current): SAVING
Customer: RAJU
Account No: 12345
Type: Savings
Balance: 8400.0

1.Deposit  2.Withdraw  3.Interest  4.Display  5.Exit
Enter choice: 5
Thank you!
```

Program 6

Create a package CIE which has two classes- Student and Internals. The class Student has members like usn, name, sem. The class Internals derived from Student has an array that stores the internal marks scored in five courses of the current semester of the student. Create another package SEE which has the class External which is a derived class of Student. This class has an array that stores the SEE marks scored in five courses of the current semester of the student. Import the two packages in a file that declares the final marks of n students in all five courses.

Code:

- Project
  - CIE
    - internals.java
    - student.java
  - SEE
    - externals.java
  - main.java

```java
package project.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);
        System.out.println("Enter CIE marks of 5 subjects:");
        for (int i = 0; i < 5; i++) {
            System.out.print("Subject " + (i + 1) + ": ");
            ciemarks[i] = s.nextInt();
        }
    }
}
```

```java
package project.CIE;
import java.util.Scanner;

public class student {
    protected String usn;
    protected String name;
    protected int sem;

    public void inputStudentDetails() {
        Scanner s = new Scanner(System.in);
        System.out.print("Enter USN: ");
        usn = s.nextLine();
        System.out.print("Enter Name: ");
        name = s.nextLine();
        System.out.print("Enter Semester: ");
        sem = s.nextInt();
    }

    public void displayStudentDetails() {
        System.out.println("\nUSN: " + usn);
        System.out.println("Name: " + name);
        System.out.println("Semester: " + sem);
    }
```

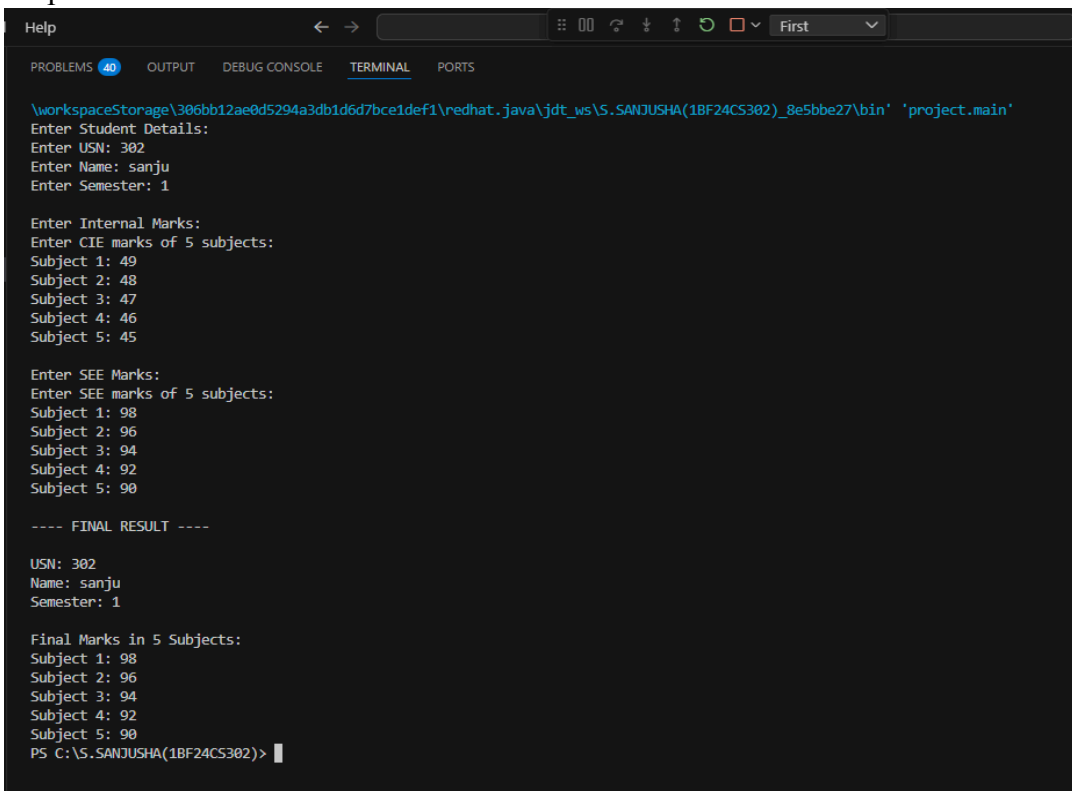
```
}
```

```
package project.SEE;
import project.CIE.internals;
import java.util.Scanner;

public class externals extends internals {

    protected int marks[];       // SEE marks
    protected int finalMarks[];  // Final CIE+SEE

    public externals() {
        marks = new int[5];
        finalMarks = new int[5];
    }

    public void inputSEEmarks() {
        Scanner s = new Scanner(System.in);
        System.out.println("Enter SEE marks of 5 subjects:");
        for (int i = 0; i < 5; i++) {
            System.out.print("Subject " + (i + 1) + ": ");
            marks[i] = s.nextInt();
        }
    }

     public void calculateFinalMarks() {
        for (int i = 0; i < 5; i++) {
            finalMarks[i] = ciemarks[i] + this.marks[i]/2; // SEE/2 + CIE
        }
    }

    public void displayFinalMarks() {
        displayStudentDetails();
        System.out.println("\nFinal Marks in 5 Subjects:");
        for (int i = 0; i < 5; i++) {
            System.out.println("Subject " + (i + 1) + ": " +
finalMarks[i]);
        }
```

```
    }
}
```

```
package project;
import project.SEE.externals;

public class main {

    public static void main(String args[]) {

        externals s = new externals();

        System.out.println("Enter Student Details:");
        s.inputStudentDetails();

        System.out.println("\nEnter Internal Marks:");
        s.inputCIEmarks();

        System.out.println("\nEnter SEE Marks:");
        s.inputSEEmarks();

        s.calculateFinalMarks();

        System.out.println("\n---- FINAL RESULT ----");
        s.displayFinalMarks();
    }
}
```

Output:



Program 7

Write a program that demonstrates handling of exceptions in inheritance tree. Create a base class called “Father” and derived class called “Son” which extends the base class. In Father class, implement a constructor which takes the age and throws the exception WrongAge( ) when the input age<0. In Son class, implement a constructor that cases both father and son’s age and throws an exception if son’s age is >=father’s age.

Code:

```
import java.util.Scanner;

class wrongAge extends Exception{
    public wrongAge(){
        super("Age Error");
    }
    public wrongAge(String message){
        super(message);
    }
}

class inputScanner{
    protected static final Scanner s = new Scanner(System.in);
```

```
}

class father extends inputScanner{
    int fatherAge;
    public father() throws wrongAge{
        System.out.println("Enter father age:");
        fatherAge = inputScanner.s.nextInt();
        if (fatherAge < 0){
            throw new wrongAge("Age cannot be negative");
        }
    }
    public void display(){
        System.out.println("Father's age:"+fatherAge);
    }
}

class son extends father{
    int sonAge;
    public son() throws wrongAge{
        super();
        System.out.println("Enter son age:");
        sonAge = inputScanner.s.nextInt();
        if (sonAge >= fatherAge){
            throw new wrongAge("Son's age cannot be greater or equal to
father's age");
        }
        else if (sonAge < 0){
            throw new wrongAge("Age cannot be negative");
        }
    }
    public void display(){
        super.display();
        System.out.println("Son's age:"+sonAge);
    }
}
public class Ageexception {
    public static void main(String[] args) {
        try {
            son Son = new son();
            Son.display();
```

```
        }
        catch (wrongAge e){
            System.out.println("Error: " + e.getMessage());
        }
        catch (Exception e) {
            System.out.println("Unexpected Error: " + e.getMessage());
        }
    }
}
```

Output:

Program 8

Write a program which creates two threads, one thread displaying “BMS College of Engineering” once every ten seconds and another displaying “CSE” once every two seconds.

Code:

```
class BMS extends Thread{
    public void run(){
        for(int i=1; i<=5; i++){
            System.out.println("BMS College Of Engineering");
            try {
                Thread.sleep(10000);
            }
            catch (Exception e) {
            }
```

```
        }
    }
}
class CS extends Thread{
    public void run(){
        for(int i=1; i<=5; i++){
            System.out.println("CSE");
            try {
                Thread.sleep(2000);
            }
            catch (Exception e) {
            }
        }
    }
}
public class multithreading {
    public static void main(String args[]){
        BMS c1 = new BMS();
        c1.start();

        CS i1 = new CS();
        i1.start();
    }
}
```

Output:

```
PS C:\S.SANJUSHA(1BF24CS302)> & 'C:\Program Files\Java\jdk-21\bin\java.exe' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\Admin\AppData\Roaming\Code\User\workspaceStorage\306bb12ae0d5294a3d
b1d6d7bce1def1\redhat.java\jdt_ws\S.SANJUSHA(1BF24CS302)_8e5bbe27\bin' 'multithreading'
BMS College Of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College Of Engineering
BMS College Of Engineering
BMS College Of Engineering
BMS College Of Engineering
```