B.M.S. COLLEGE OF ENGINEERING
Basavanagudi, Bengaluru- 560019
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

LAB REPORT

On

Object Oriented Java Programming
(23CS3PCOOJ)

Submitted By:

DHANUSH T

In partial fulfilment of

BACHELOR OF ENGINEERING

In

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Faculty-In-Charge

Swathi Sridharan

Assistant Professor
Department of Computer Science and Engineering

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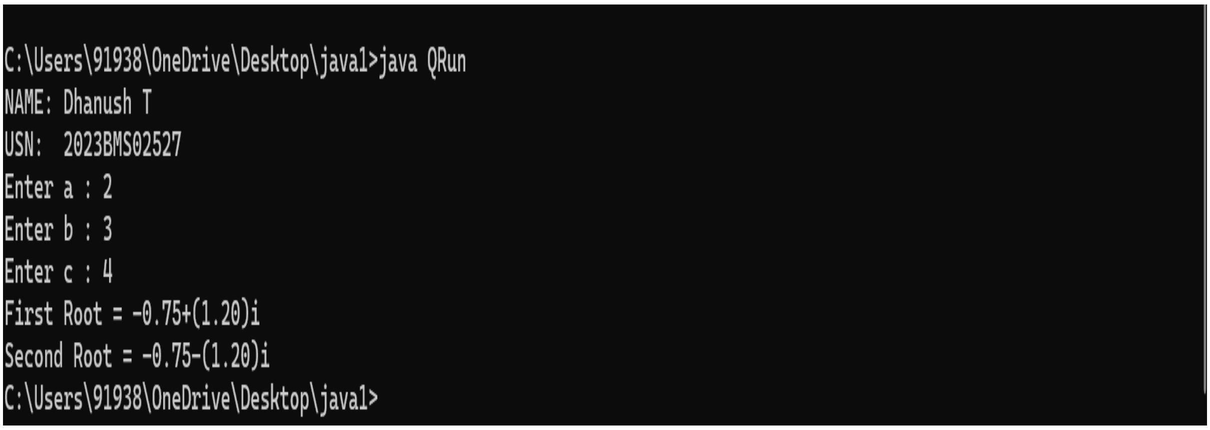
Lab Program 1:

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;
import java.lang.Math;
class prog1
{
public static void main(String xx[])
{
float a,b,c,d,r1,r2;
Scanner s1=new Scanner(System.in);
System.out.println("enter the
coefficients"); a=s1.nextFloat();
b=s1.nextFloat(); c=s1.nextFloat(); d=b*b-
(4*a*c); if(d>0)
{
r1=(-b+(float)Math.sqrt(d))/(2*a); r2=(-b-
(float)Math.sqrt(d))/(2*a); System.out.println("r1="+r1);
System.out.println("r2="+r2);
}
else if(d==0)
{
r1=(-b)/(2*a); r2=(-
b)/(2*a);
System.out.println("r1="+r1);
System.out.println("r2="+r2);
}
else
{
r1=(float)Math.sqrt(-d)/(2*a);
r2=-1*r1;
System.out.println("roots:\n"+"r1="+(-b/(2*a))+"+"+r1+"i"+"\nr2="+(-b/(2*a))+r2+"i");
}
}
}
```

Ouput:



```
C:\Users\91938\OneDrive\Desktop\java1>java QRun
NAME: Dhanush T
USN:  2023BMS02527
Enter a : 2
Enter b : 3
Enter c : 4
First Root = -0.75+(1.20)i
Second Root = -0.75-(1.20)i
C:\Users\91938\OneDrive\Desktop\java1>
```

Lab Program 2:

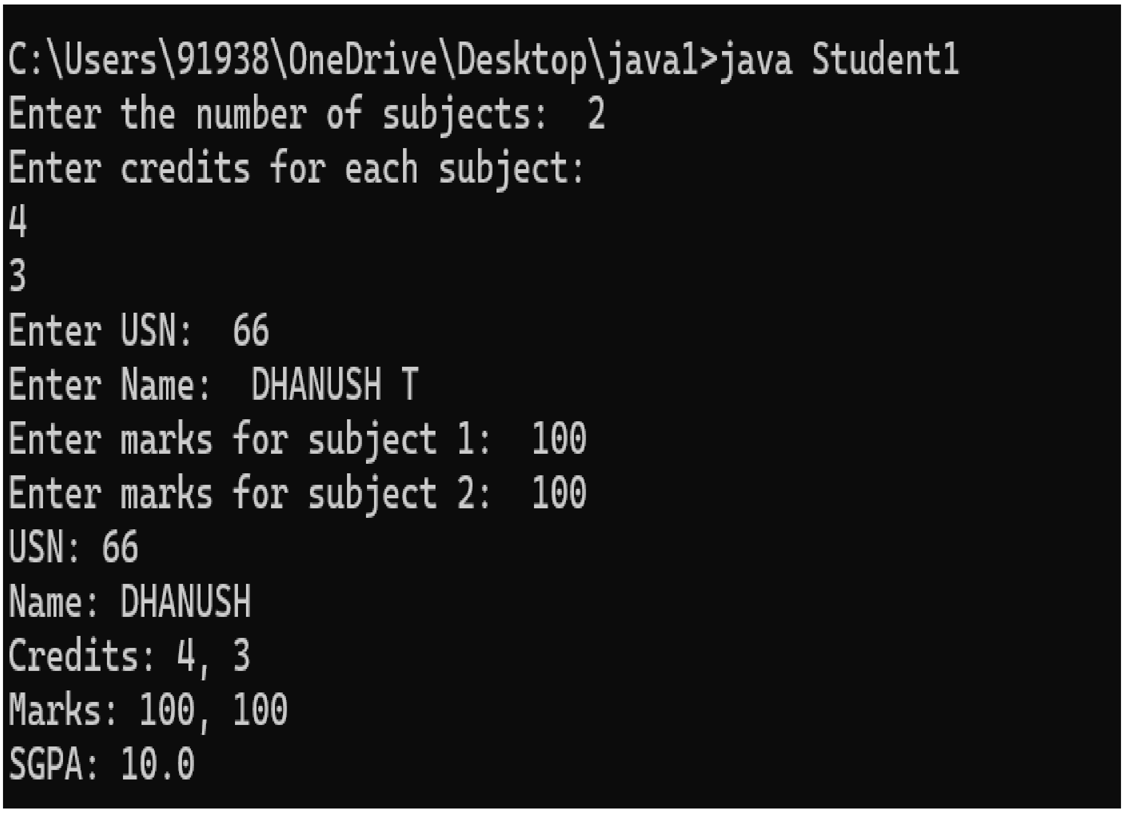
Develop a Java program to create a class Student with members usn, name, an array credits and an array marks. Include methods to accept and display details and a method to calculate SGPA of a student.

Code:

```
import java.util.*;
class Student{
        private String usn;
        private int []
marks;          private int
[] credits;
         private String name;

          public void accept(){
                Scanner in = new Scanner(System.in);
        System.out.println("Enter your name: ");
                 name=in.nextLine();
                 System.out.println("Enter your usn: ");
                 usn=in.nextLine();
                  System.out.println("Enter the number of subject: ");
                int n;
                n=in.nextInt();
                marks = new int[n];
                credits = new
int[n];                 for(int
i=0;i<n;i++){
                        System.out.println("Enter the marks of subject "+(i+1)+" : ");
                marks[i]=in.nextInt();
                        System.out.println("Enter credits of subject "+(i+1)+" : ");
        credits[i]=in.nextInt();

        }
        }
          public void display(){
                  System.out.println("Name: "+name+" USN: "+usn);
                 for(int i=0;i<marks.length;i++){
                           System.out.println("The marks of a subject "+(i+1)+" : "+marks[i]);
                           System.out.println("The credits of the subject : "+credits[i]);
                };
        }
```

```
            public void sgpa(){
                    double score=0;
                    double sum=0;

                     for(int i=0;i<marks.length;i++){
                              double grade;
                             if(marks[i]>=90)grade=10;
          else if(marks[i]>=80 && marks[i]<90)grade=9;
          else if(marks[i]>=70 && marks[i]<80)grade=8;
          else if(marks[i]>=60 && marks[i]<70)grade=7;
          else if(marks[i]>=50 && marks[i]<60)grade=6;
          else if(marks[i]>=40 && marks[i]<50)grade=5;
                             else grade=4;
          sum=sum+credits[i];
                               score=score+credits[i]*grade;
                    }
                     score=score/sum;
                           System.out.println("The SGPA of USN: "+usn+" Name: "+name+" is :
"+score);
          }
}

public class Prog2{
          public static void main(String[]args){
          Student s= new Student();
          s.accept();
                    s.display();
    s.sgpa();
          }
}
```

Output:



```
C:\Users\91938\OneDrive\Desktop\java1>java Student1
Enter the number of subjects:  2
Enter credits for each subject:
4
3
Enter USN:  66
Enter Name:  DHANUSH T
Enter marks for subject 1:  100
Enter marks for subject 2:  100
USN: 66
Name: DHANUSH
Credits: 4, 3
Marks: 100, 100
SGPA: 10.0
```

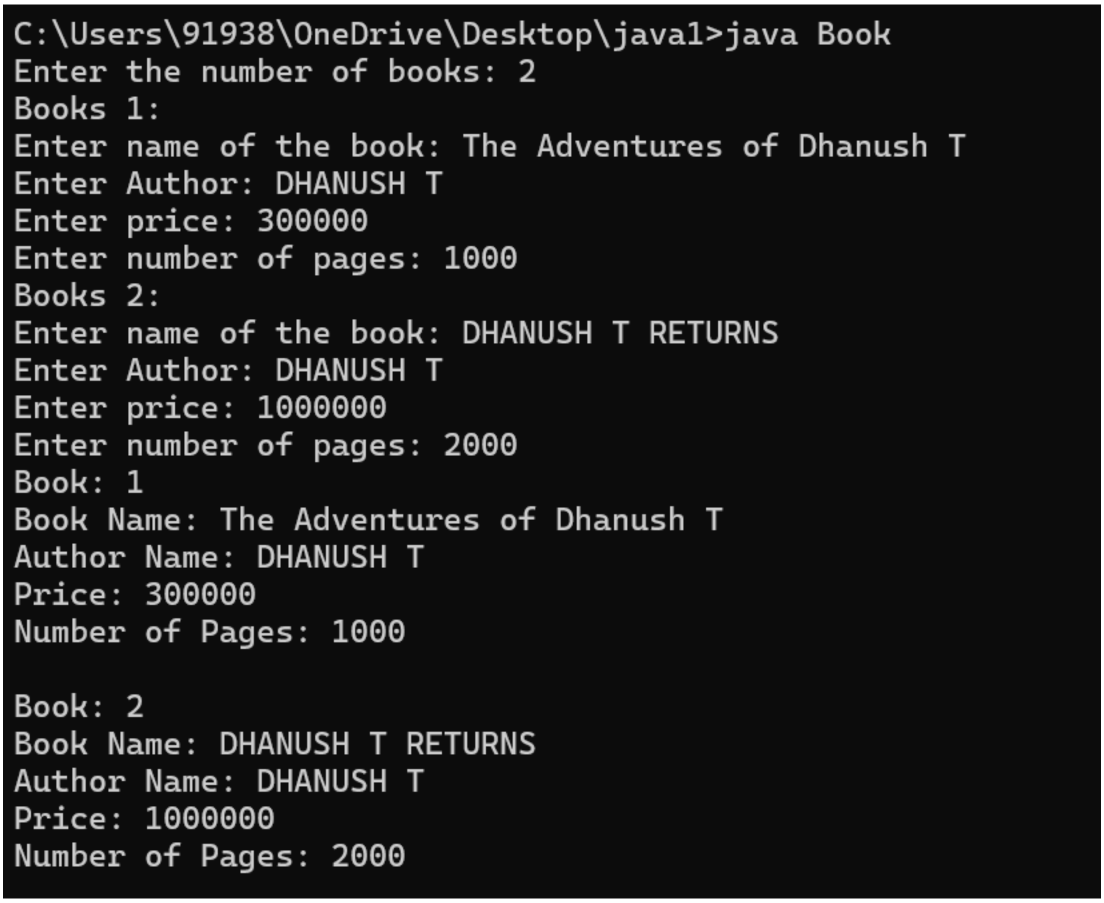
Lab Program 3:

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;
   String author;
   int price;
   int numPages;

   Books() {}
   Books(String name,
String author, int price, int
numPages) {
       this.name = name;
       this.author = author;
       this.price = price;
       this.numPages =
numPages;
   }

   public String toString() {
       return "Book Name: "
+ name + "\n" +
             "Author Name: " +
author + "\n" +
             "Price: " + price +
"\n" +
             "Number of Pages:
" + numPages + "\n";
   }
}

class Book{
   public static void
main(String[] args) {
        Scanner sc = new
Scanner(System.in);
        int n;
        String name, author;
        int price, numPages;


System.out.print("Enter
the number of books: ");
        n = sc.nextInt();
        sc.nextLine();

        Books[] b = new
Books[n];

        for(int i = 0; i < n; i++) {

System.out.println("Books
" + (i + 1) + ": ");

System.out.print("Enter
name of the book: ");
            name =
sc.nextLine();

System.out.print("Enter
Author: ");
            author =
sc.nextLine();

System.out.print("Enter
price: ");
            price = sc.nextInt();
            sc.nextLine();

System.out.print("Enter
number of pages: ");
            numPages =
sc.nextInt();
            sc.nextLine();
            b[i] = new
Books(name, author, price,
numPages);
        }

        for (int i = 0; i < n; i++)
{

System.out.println("Book:
" + (i + 1) + "\n" + b[i]);
        }
        sc.close();
    }
}
```

Output:



```
C:\Users\91938\OneDrive\Desktop\java1>java Book
Enter the number of books: 2
Books 1:
Enter name of the book: The Adventures of Dhanush T
Enter Author: DHANUSH T
Enter price: 300000
Enter number of pages: 1000
Books 2:
Enter name of the book: DHANUSH T RETURNS
Enter Author: DHANUSH T
Enter price: 1000000
Enter number of pages: 2000
Book: 1
Book Name: The Adventures of Dhanush T
Author Name: DHANUSH T
Price: 300000
Number of Pages: 1000

Book: 2
Book Name: DHANUSH T RETURNS
Author Name: DHANUSH T
Price: 1000000
Number of Pages: 2000
```

Lab Program 4:

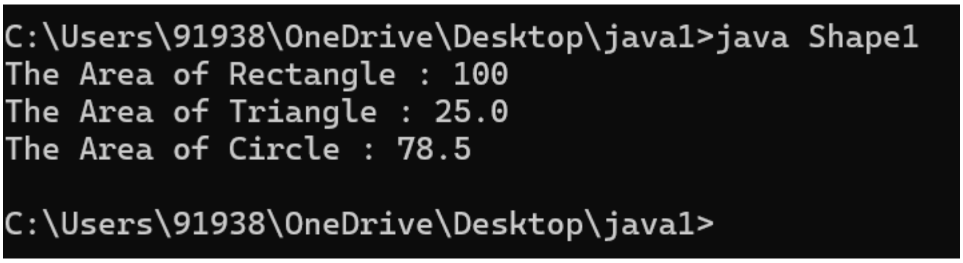
Develop a Java program to create an abstract class named Shape that contains two integers and an empty method named printArea( ). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contain only the method printArea(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

Code:

```
abstract class Shape{
   private int a,b;
   Shape(){
   }
   abstract void printArea();
}

class Rectangle extends Shape{
   private int a, b;
      Rectangle(int a, int b)
   {
this.a=a;
      this.b=b;
   }
   void printArea()
   {
      System.out.println("The area of rectangle is: "+(a*b));
   }
}

class Triangle extends Shape{
             private int a, b;
             Triangle(int a, int b)
             {
          this.a=a;
                this.b=b;
             }
             void printArea()
             {
                System.out.println("The area of triangle is: "+(0.5*a*b));
             }
          }
```

```
class Circle extends Shape{
    private int a;
    Circle(int a)
    {
        this.a=a;
    }
    void printArea()
    {
        System.out.println("The area of circle is: "+(3.14*a*a));
    }
}

public class Prog4{
    public static void main(String[]args)
    {
        Shape rectangle=new Rectangle(3,6);
        Shape triangle=new Triangle(4,6);
Shape circle=new Circle(5);
rectangle.printArea();
triangle.printArea();
        circle.printArea();

    }
}
```

Output:



```
C:\Users\91938\OneDrive\Desktop\java1>java Shape1
The Area of Rectangle : 100
The Area of Triangle : 25.0
The Area of Circle : 78.5

C:\Users\91938\OneDrive\Desktop\java1>
```

Lab 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. Create a class Account that stores customer name, account number and type of account. From this derive the classes Cur-acct and Sav-acct to make them more specific to their requirements. Include the necessary methods in order to achieve the following tasks:

a) Accept deposit from customer and update the balance.
b) Display the balance.
c) Compute and deposit interest
d) Permit withdrawal and update the balance

Check for the minimum balance, impose penalty if necessary and update the balance.

Code:

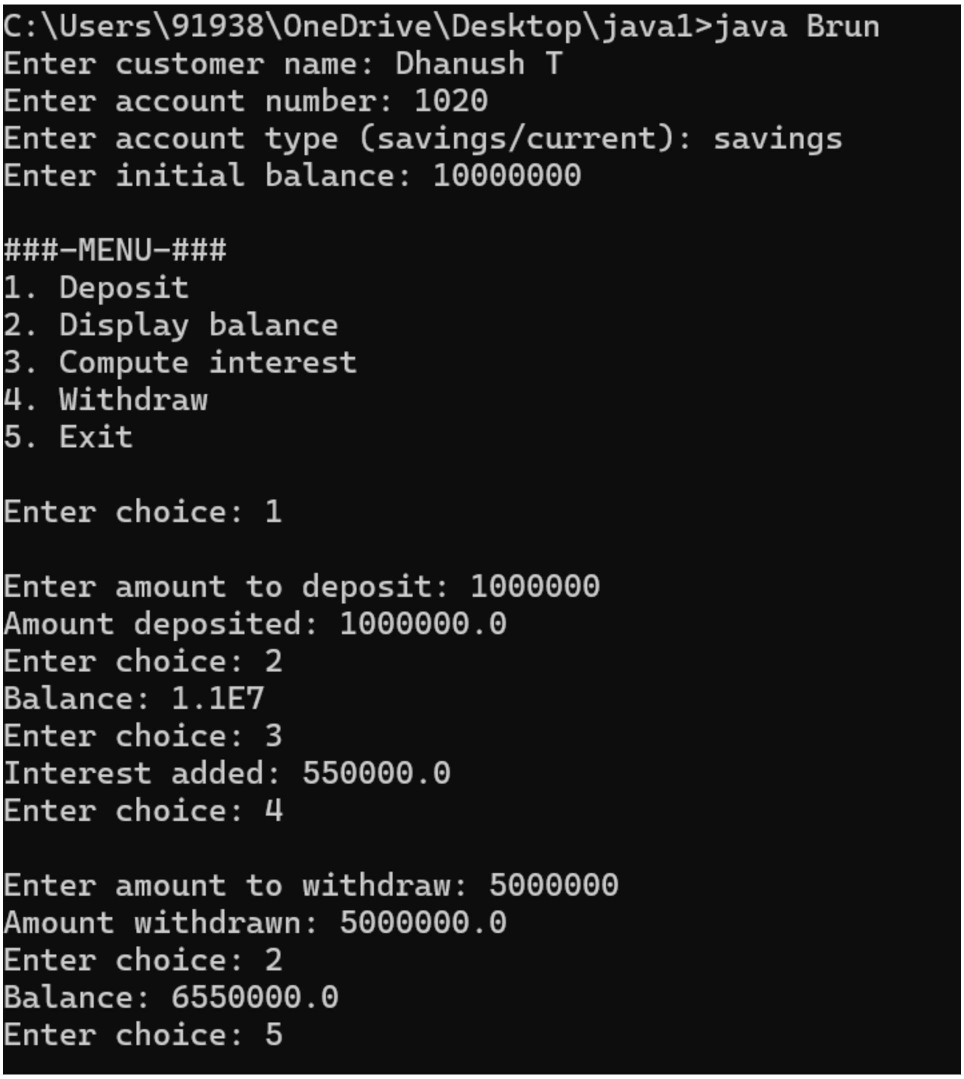
```
import java.util.Scanner;
        class Account{
        String name;
        String type;
        int acc_num;
          double dep;

          public void info(String name,String type,int acc_num, double dep){
        this.name=name;
             this.type=type;
        this.acc_num=acc_num;
             this.dep=dep;
          }

          public void details(){
             System.out.println("Name: "+name);
             System.out.println("Account Type: "+type);
             System.out.println("Account Number: "+acc_num);
             System.out.println("Current Balance: "+dep);
```

```
            }

          }

          class Savings extends Account{
          public void deposit(double amount){
          dep=dep+amount;
                System.out.println("Balance: "+dep);

            }
            public void withdraw(double amount)
            {
               if(dep<amount)
               {
                  System.out.println("Enter insufficient funds.");
               }
               else{
                  dep=dep-amount;
               }
               System.out.println("Balance: "+dep);
            }
            public void interest(double t, double r){        double
          dep1=dep*Math.pow((1+r/100.0),t);
          System.out.println("Interest: "+(dep1-dep));dep=dep1;
                System.out.println("Interest Deposited Amount : "+dep);
            }
}

class Current extends Account{
public void deposit(double amount){
dep=dep+amount;
      System.out.println("Balance: "+dep);
   }
   public void withdraw(double amount)
   {
      if(dep<amount)
      {
         System.out.println("Enter insufficient funds.");
      }
      else{
         dep=dep-amount;
      }
      check(dep);
   }

   public void check(double amount)
   {
      if(dep<2000)
      {
         if(dep<500)
         {
            dep=0;
         }
else
         {
            dep=dep-500;
         }
         System.out.println("Insufficient Balance!!!! Amount less than Rs. 2000.
Rs. 500 deducted. Rs.");
      }
      System.out.println("Balance: "+dep);
   }
}

public class Prog5
{
   public static void main(String[]args)
   {
      Scanner in = new Scanner(System.in);
int c1=1;
                while(c1==1)
                {
                   System.out.println("Enter Name: ");
          String name=in.next();
                   in.nextLine();
                   System.out.println("Enter Account Number: ");
                   int acc_no=in.nextInt();
                   int choice1;
                   System.out.println("1.Savings 2.Current");
          System.out.println("Enter Account Type: ");
                   choice1=in.nextInt();
          switch (choice1){
          case 1:
                         Savings    s    =    new    Savings();
          System.out.println("Enter                deposit");
          double balance=in.nextDouble();
```

```
                    s.info(name,"Savings",acc_no,balance);
                    s.details();
                    System.out.println("1.Deposit 2.Withdraw 3.Interest 4.Exit");int choice2;
                    do{
                    System.out.println("Enter your choice: ");
                    choice2=in.nextInt();
        switch (choice2){
        case 1:
                         System.out.println("Enter amount: ");
        double       amount1       =       in.nextDouble();
        s.deposit(amount1);
                         break;
        case 2:
                         System.out.println("Enter amount: ");
        double       amount2       =       in.nextDouble();
        s.withdraw(amount2);
                         break;
        case 3:
                         System.out.println("Enter time period: ");
        double time=in.nextDouble();
        System.out.println("Enter rate: ");                  double
        rate=in.nextDouble();
        s.interest(time,rate);
                         break;
        case 4:
        break;
        default:
                 System.out.println("Invalid choice.");
            }}while(choice2>=1&&choice2<=3);
            break;
case 2:
            Current c=new Current();
            do{
               System.out.println("Enter deposit(>2000)");
balance=in.nextDouble();
            }while(balance<2000);
            c.info(name,"Current",acc_no,balance);
            c.details();
            System.out.println("1.Deposit 2.Withdraw 3.Exit");
int choice3;             do{
            System.out.println("Enter your choice: ");
```

```
                choice3=in.nextInt();
switch (choice3){
case 1:
                      System.out.println("Enter amount: ");
double         amount1         =         in.nextDouble();
c.deposit(amount1);
                      break;
case 2:
                      System.out.println("Enter amount: ");
double         amount2         =         in.nextDouble();
c.withdraw(amount2);
                      break;
case 3:
break;
default:
                      System.out.println("Invalid choice.");
                }}while(choice3>=1&&choice3<=2);
default:
                System.out.println("Invalid Choice");
          }
          System.out.println("Enter 1 to continue or 0 to exit");
          int c2 =in.nextInt();c1=c2;
       }
       in.close();
   }
}
```

Output:



```
C:\Users\91938\OneDrive\Desktop\java1>java Brun
Enter customer name: Dhanush T
Enter account number: 1020
Enter account type (savings/current): savings
Enter initial balance: 10000000

###-MENU-###
1. Deposit
2. Display balance
3. Compute interest
4. Withdraw
5. Exit

Enter choice: 1

Enter amount to deposit: 1000000
Amount deposited: 1000000.0
Enter choice: 2
Balance: 1.1E7
Enter choice: 3
Interest added: 550000.0
Enter choice: 4

Enter amount to withdraw: 5000000
Amount withdrawn: 5000000.0
Enter choice: 2
Balance: 6550000.0
Enter choice: 5
```

Lab Program 6:

Create a package CIE which has two classes- Student and Internals. The class Personal has members like usn, name, sem. The class internals 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.

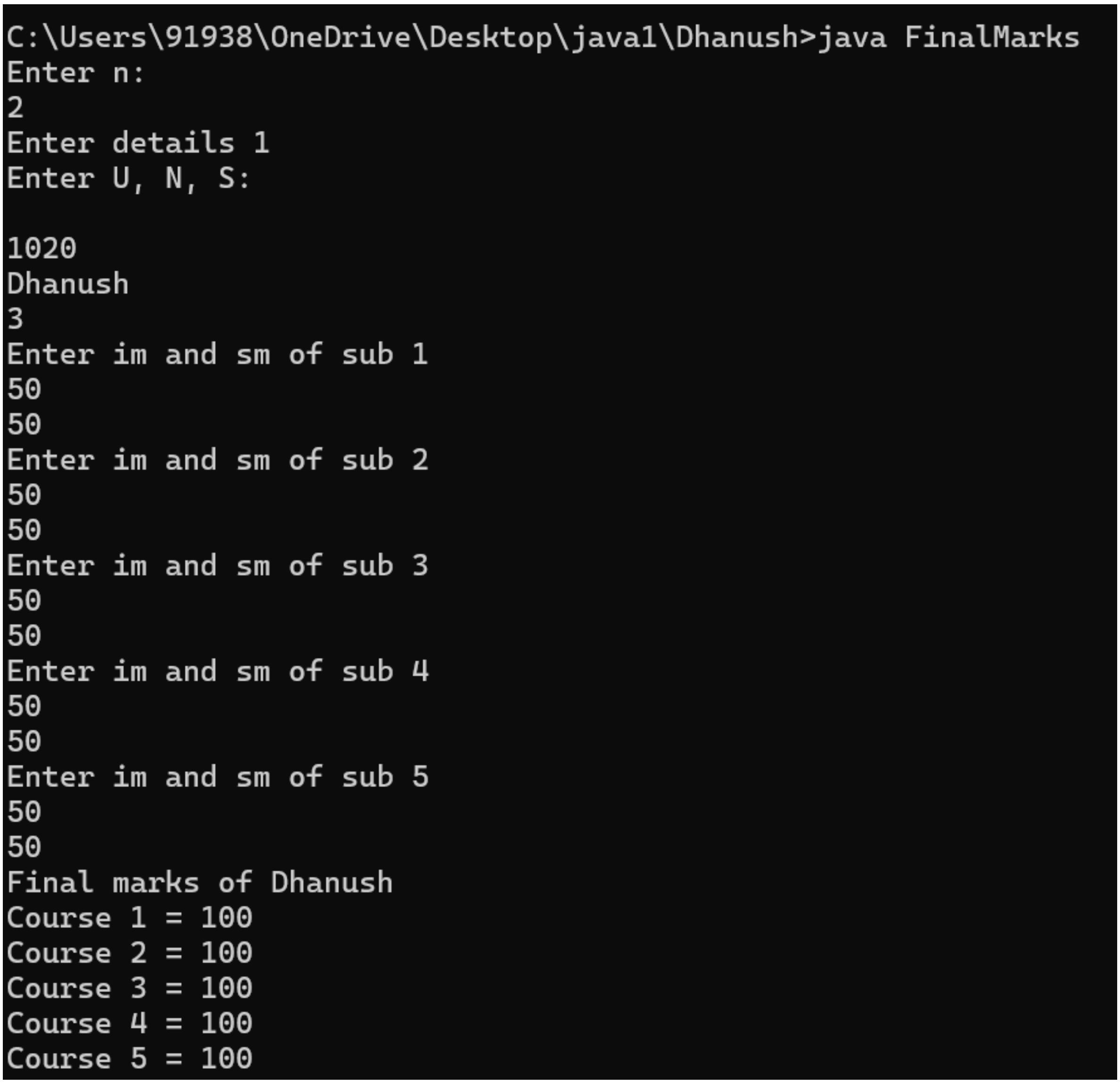
Code:

```
package CIE;
import java.util.*;
public class Student{
        public String name;
        public String usn;
        public int sem;
        public void
display(){
                Scanner sc = new Scanner(System.in);
                System.out.println("Name:");
        name = sc.next();
                System.out.println("USN:");
        usn = sc.next();
                 System.out.println("Sem:");
                 sem = sc.nextInt();
        }
}

package CIE;
import java.util.*;
public class Internals extends Student{
        public double ciem[];
          public void display(){
                 ciem = new double[5];
                   Scanner c = new Scanner(System.in);
                  System.out.println("Eneter cie marks out of 50:");
                 for(int i=0;i<5;i++){
                          ciem[i] = c.nextDouble();
                }
```

```
            }
}

package SEE;
import CIE.*;
import java.util.*;
public class Externals extends CIE.Student{
            public double seem[];
            public void display(){
                        seem = new double[5];
                          Scanner s = new Scanner(System.in);
                           System.out.println("SEE marks for 5 subjects out of 100:");
                        for(int i=0;i<5;i++){
                                    seem[i]=s.nextDouble();
                        }
            }
}

import CIE.*;
import SEE.*;
import java.util.*;
public class Main{
               public static void main(String[] args){
                       int n;
                      Scanner sc = new Scanner(System.in);
            System.out.println("Enter no. of students:");
                        n = sc.nextInt();
                         CIE.Student st[] = new CIE.Student[n];
                      CIE.Internals in[] = new CIE.Internals[n];
            SEE.Externals ex[] = new SEE.Externals[n];
                      for(int i=0;i<n;i++){
            st[i] = new CIE.Student();
            in[i] = new CIE.Internals();
            ex[i] = new SEE.Externals();
            st[i].display();
            in[i].display();
                                  ex[i].display();
                                    System.out.println("Total Marks of "+st[i].name+"\n");
                                  for(int j=0;j<5;j++){
                                              System.out.println(in[i].ciem[j]+ex[i].seem[j]/2);
                                  }
                      }
            }
```

```
}
```

Output:



```
C:\Users\91938\OneDrive\Desktop\java1\Dhanush>java FinalMarks
Enter n:
2
Enter details 1
Enter U, N, S:

1020
Dhanush
3
Enter im and sm of sub 1
50
50
Enter im and sm of sub 2
50
50
Enter im and sm of sub 3
50
50
Enter im and sm of sub 4
50
50
Enter im and sm of sub 5
50
50
Final marks of Dhanush
Course 1 = 100
Course 2 = 100
Course 3 = 100
Course 4 = 100
Course 5 = 100
```

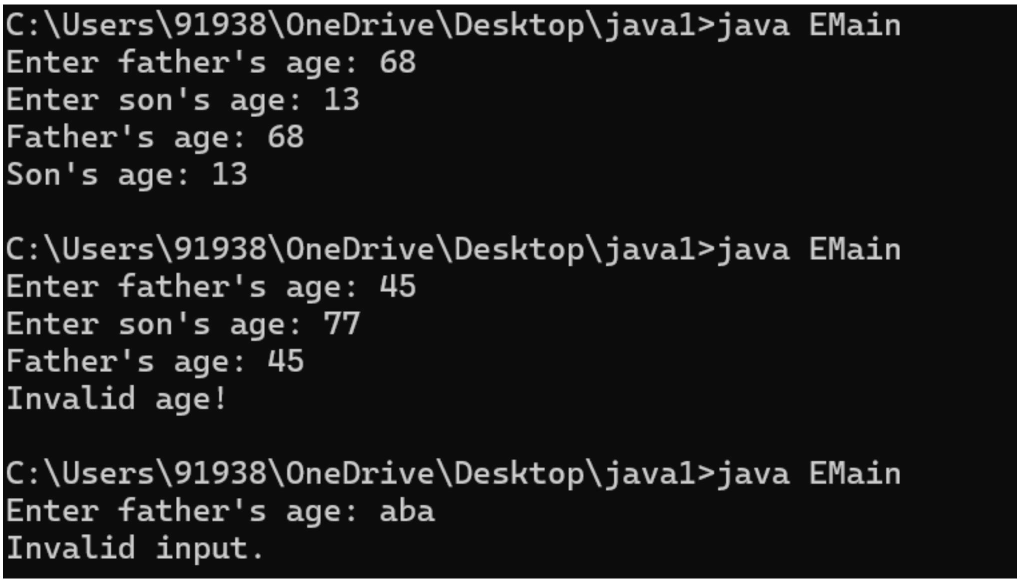
Lab Program 7:

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(String message) {
        super(message);
    }
}
class Father {
int fatherAge;
    public Father(int fatherAge) throws WrongAge {
if (fatherAge < 0) {
            throw new WrongAge("Age cannot be negative");
        }
        this.fatherAge = fatherAge;
    }
}
class Son extends Father {
    int sonAge;
    public Son(int fatherAge, int sonAge) throws WrongAge {
super(fatherAge);        if (sonAge >= fatherAge) {
            throw new WrongAge("Son's age must be less than Father's age");
        }
        this.sonAge = sonAge;
    }
}
public class fatherson {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter father's age and son's age: ");
int fa=sc.nextInt();
        int sa=sc.nextInt();
        try {
            Son s = new Son(fa, sa);
            System.out.println("Father's age: " + s.fatherAge);
            System.out.println("Son's age: " + s.sonAge);
        } catch (WrongAge e) {
            System.out.println("Error: " + e.getMessage());
        }
    }
}
```

Output:



```
C:\Users\91938\OneDrive\Desktop\java1>java EMain
Enter father's age: 68
Enter son's age: 13
Father's age: 68
Son's age: 13

C:\Users\91938\OneDrive\Desktop\java1>java EMain
Enter father's age: 45
Enter son's age: 77
Father's age: 45
Invalid age!

C:\Users\91938\OneDrive\Desktop\java1>java EMain
Enter father's age: aba
Invalid input.
```

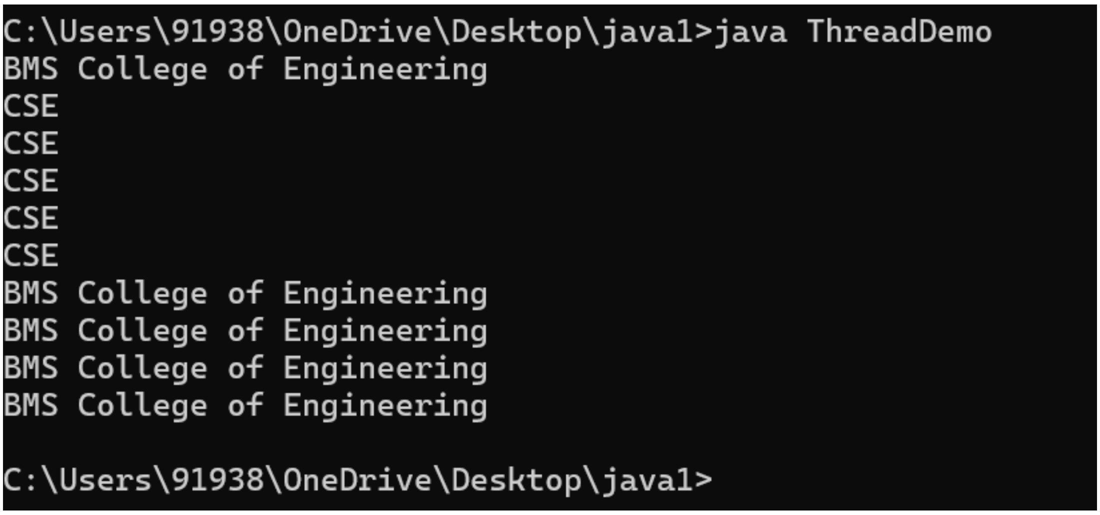
Lab Program 8:

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 DisplayThread
extends Thread {
    private String message;
    private int interval;

    public
DisplayThread(String
message, int interval) {
        this.message =
message;
        this.interval = interval;
    }

    public void run() {
        try {
            for(int i = 0; i < 5;
i++) {

System.out.println(messag
e);

Thread.sleep(interval *
1000);
            }
        } catch
(InterruptedException e) {
            e.printStackTrace();
        }
    }
}

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



       DisplayThread thread1
= new DisplayThread("BMS
College of Engineering",
10);
       thread1.start();

       DisplayThread thread2
= new
DisplayThread("CSE", 2);
       thread2.start();
   }
}
```

Output:



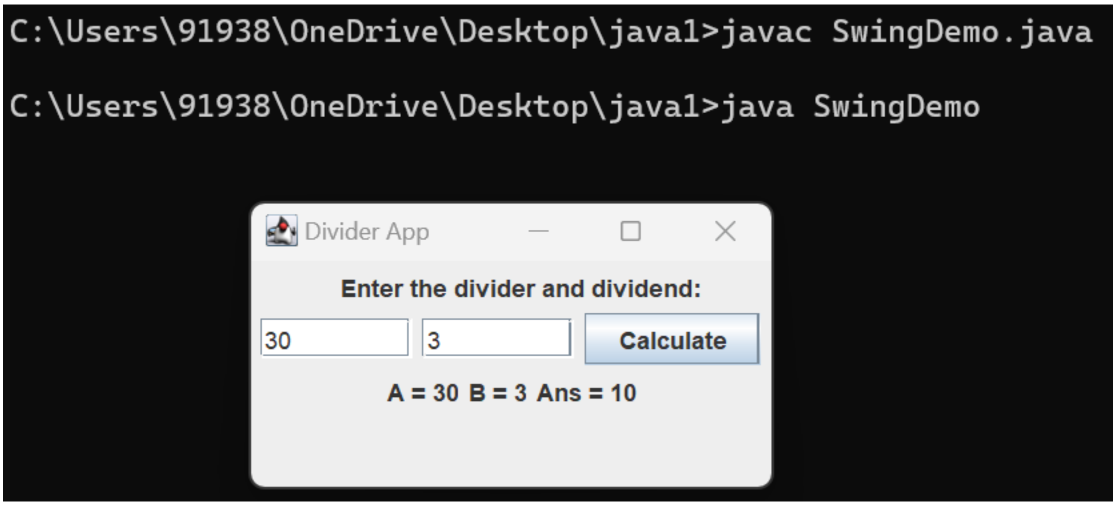
```
C:\Users\91938\OneDrive\Desktop\java1>java ThreadDemo
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
BMS College of Engineering
BMS College of Engineering
BMS College of Engineering

C:\Users\91938\OneDrive\Desktop\java1>
```

Lab Program 9:

Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a NumberFormatException. If Num2 were Zero, the program would throw an Arithmetic Exception Display the exception in a message dialog box. **Code:**

```
import javax.swing.*;
import java.awt.*;
import java.awt.event.*;

class SwingDemo{
  SwingDemo(){
    JFrame jfrm = new JFrame("Divider App");
    jfrm.setSize(275, 150);
jfrm.setLayout(new FlowLayout());
    jfrm.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
    JLabel jlab = new JLabel("Enter the divider and divident:");
    JTextField ajtf = new JTextField(8);
    JTextField bjtf = new JTextField(8);
    JButton button = new JButton("Calculate");
    JLabel err = new JLabel();
    JLabel alab = new JLabel();
    JLabel blab = new JLabel();
JLabel anslab = new JLabel();
    jfrm.add(err);
    jfrm.add(jlab);
jfrm.add(ajtf);
jfrm.add(bjtf);
jfrm.add(button);
jfrm.add(alab);
jfrm.add(blab);
jfrm.add(anslab);
    ActionListener l = new ActionListener() {
public void actionPerformed(ActionEvent evt) {
        System.out.println("Action event from a text field");
      }
    };
    ajtf.addActionListener(l);
bjtf.addActionListener(l);
    button.addActionListener(new ActionListener() {
        public void actionPerformed(ActionEvent evt) {
try{
            int a = Integer.parseInt(ajtf.getText());
int b = Integer.parseInt(bjtf.getText());
            int ans = a/b;
alab.setText("\nA = " + a);
blab.setText("\nB = " + b);
            anslab.setText("\nAns = "+ ans);
          }
          catch(NumberFormatException e){
            alab.setText("");
blab.setText("");
anslab.setText("");
            err.setText("Enter Only Integers!");
          }
          catch(ArithmeticException e){
            alab.setText("");
blab.setText("");
anslab.setText("");
            err.setText("B should be NON zero!");
          }
        }
      });
      jfrm.setVisible(true);
   }
   public static void main(String args[]){
SwingUtilities.invokeLater(new Runnable(){
        public void run(){
new SwingDemo();          }
      });
   }
}
```

Output:



```
C:\Users\91938\OneDrive\Desktop\java1>javac SwingDemo.java

C:\Users\91938\OneDrive\Desktop\java1>java SwingDemo
```

Divider App

Enter the divider and dividend:

30

3

A = 30 B = 3 Ans = 10