BMS COLLEGE OF ENGINEERING
DEPT. OF COMPUTER SCIENCE
SEM 3
OOJ
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SECTION:CSE-A
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YEAR: 2020

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 discriminant b2-4ac is negative, display a message stating that there are no real solutions.

```
import java.util.Scanner;
import java.lang.Math;
class RealSolution
{
    private int a,b,c;

    void accept()
    {
        System.out.println("A Quadratic Equation is of the form ax^2 + bx + c = 0");
        System.out.println("Enter values of a,b,c in order to find out the roots of the eqn");
        Scanner sc = new Scanner(System.in);

        System.out.print("Enter the value of a: ");
        this.a = sc.nextInt();

        System.out.print("Enter the value of b: ");
        this.b = sc.nextInt();

        System.out.print("Enter the value of c: ");
        this.c = sc.nextInt();
    }

    double calculateD()
    {
        double D = (b*b)- (4*a*c);
        if(D<0)
            return -999;
        else
            return D;
    }
    void displayResult(double D)
    {
        double r1,r2;
        if(D == -999)
            System.out.print("Roots are complex");
        else
        {
            r1 = (-b + Math.sqrt(D))/(2*a);
            r2 = (-b - Math.sqrt(D))/(2*a);
            System.out.println("Roots are:"+ r1 + " " + r2);
        }
    }
    public static void main(String args[])
    {
        RealSolution rs = new RealSolution();
        rs.accept();
        double Discriminate = rs.calculateD();
        rs.displayResult(Discriminate);
    }
}
```

```
Process started (PID=22780) >>>
A Quadratic Equation is of the form ax^2 + bx + c = 0
Enter values of a,b,c in order to find out the roots of the eqn
Enter the value of a: 1
Enter the value of b: 2
Enter the value of c: 1
Roots are:-1.0 -1.0
```

LP1 Observation:

```
WEEK 1

import java.util.Scanner;
import java.lang.Math;
class RealSolution{
    private int a,b,c;
    void accept(){
        System.out.println("A Quadratic eqn. is of the form
                            ax^2 + bx + c = 0");
        System.out.println("Enter the values of a, b, c to find
                            out the roots of the equation");
        Scanner sc = new Scanner(System.in);

        System.out.print("Enter the value of a:");
        this.a = sc.nextInt();
        System.out.print("Enter value of b:");
        this.b = sc.nextInt();
        System.out.print("Enter value of c:");
        this.c = sc.nextInt();
    }
    double calculateD(){
        double D = (b*b) - 4*(a*c);
        if (D < 0)
            return -999;
        else
            return D;
    }
    void DisplayResult(double D){
        double r1, r2;
        if (D == -999)
            System.out.print("Roots are complex");
        else
        { r1 = (-b + Math.sqrt(D)) / 2a;
          r2 = (-b - Math.sqrt(D)) / 2a;
        } System.out.println("Roots are:" + "r1" + "," + "r2");
    }
    public static void main(String args[]){
        RealSolution rs = new RealSolution();
        rs.accept();
        double Discriminate = rs.calculateD();
        rs.displayResult(Discriminate);
    }
}
```

Expected o/p :-

A quadratic equation is of the form $ax^2 + bx + c = 0$

Enter values of a, b, c in order to find Roots of eqn.

Enter value of a : 1

Enter value of b : 0

Enter value of c : -1

Roots are : -1.0, 1.0

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.

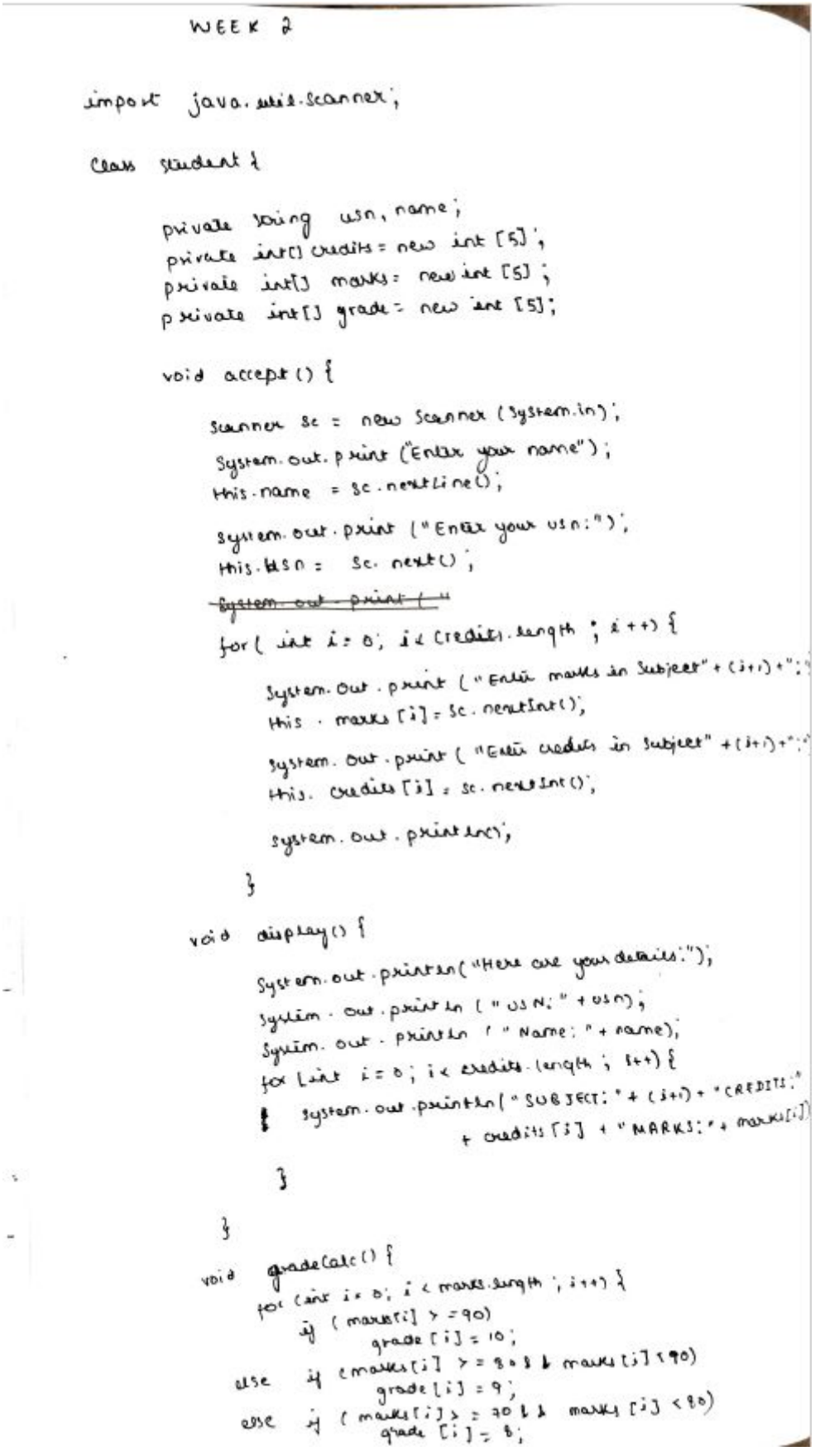
```java
import java.util.Scanner;

class Student{
    String usn,name;
    int sem;

    void acceptDetails1(){
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter your Name: ");
        this.name = sc.nextLine();

        System.out.print("Enter your USN: ");
        this.usn = sc.next();

        System.out.print("Enter Semester: ");
        this.sem = sc.nextInt();
    }
}

class Test extends Student{
    int[] cie = new int[5];
    int[] credits = new int[5];

    void acceptDetails2(){
        for(int i=0;i<credits.length;i++)
        {
            Scanner sc = new Scanner(System.in);
            System.out.print("Enter cie marks in Subject " + (i+1) + " (out of 50): ");
            this.cie[i] = sc.nextInt();

            System.out.print("Enter credits of Subject " + (i+1) + ": ");
            this.credits[i] = sc.nextInt();

            System.out.println();
        }
    }
}

class Exam extends Test{
    int[] see = new int[5];

    void acceptDetails3(){
        for(int i=0;i<credits.length;i++)
        {
```

```
            Scanner sc = new Scanner(System.in);
            System.out.print("Enter see marks in Subject " + (i+1) + " (out of 100): ");
            this.see[i] = sc.nextInt();

            System.out.println();
        }
    }
}

class Result extends Exam{
    int[] grade = new int[5];
    int[] marks= new int[5];

    void calcMarks(){
        for(int i=0;i<credits.length;i++)
        {
            marks[i] = cie[i] + see[i]/2;
        }
    }
    public void calcGrade(){
        calcMarks();
        for(int i=0;i<marks.length;i++)
        {
            if(marks[i] >= 90)
                grade[i] = 10;
            else if(marks[i] >= 80 && marks[i] < 90)
                grade[i] = 9;
            else if(marks[i] >= 70 && marks[i] < 80)
                grade[i] = 8;
            else if(marks[i] >= 60 && marks[i] < 70)
                grade[i] = 7;
            else if(marks[i] >= 50 && marks[i] < 60)
                grade[i] = 6;
            else if(marks[i] >= 40 && marks[i] < 50)
                grade[i] = 4;
            else
                grade[i] = 0;

        }
    }
    public void SGPA(){
        double sum = 0,totalCred = 0;
        calcGrade();
```

```
        for(int i=0;i<credits.length;i++)
        {
            sum+= grade[i]*credits[i];
            totalCred+= credits[i];
        }

        System.out.print("Sgpa is: "+(sum/totalCred));
    }
    public void display(){
        System.out.println("USN: "+ usn);
        System.out.println("Name: "+name);
        for(int i=0;i<credits.length;i++)
        {
            System.out.println("SUBJECT " + (i+1) + " CREDITS: " + credits[i] + " CIE: " + cie[i] + " SEE: " + see[i]);
        }
        SGPA();
    }
}

class StudentTester{
    public static void main(String[] args){
    int n;
    Scanner sc = new Scanner(System.in);
    System.out.print("How many student details do you want to enter? ");
    n = sc.nextInt();
    Result[] r = new Result[n];

    for(int i=0;i<n;i++){
        r[i] = new Result();
        r[i].acceptDetails1();
        r[i].acceptDetails2();
        r[i].acceptDetails3();
    }
    System.out.println("\nHere are your details:");
    for(int i=0;i<n;i++){
        System.out.println("Student"+(i+1));
        r[i].display();
    }
    }
}
```

```
Enter your Name: medha
Enter your USN: 1BM19EC074
Enter Semester: 3
Enter cie marks in Subject 1 (out of 50): 50
Enter credits of Subject 1: 5

Enter cie marks in Subject 2 (out of 50): 49
Enter credits of Subject 2: 3

Enter cie marks in Subject 3 (out of 50): 48
Enter credits of Subject 3: 4

Enter cie marks in Subject 4 (out of 50): 45
Enter credits of Subject 4: 4

Enter cie marks in Subject 5 (out of 50): 50
Enter credits of Subject 5: 3

Enter see marks in Subject 1 (out of 100): 90

Enter see marks in Subject 2 (out of 100): 80

Enter see marks in Subject 3 (out of 100): 80

Enter see marks in Subject 4 (out of 100): 85

Enter see marks in Subject 5 (out of 100): 75


Here are your details:
Student1
USN: 1BM19EC074
Name: medha
SUBJECT 1 CREDITS: 5 CIE: 50 SEE: 90
SUBJECT 2 CREDITS: 3 CIE: 49 SEE: 80
SUBJECT 3 CREDITS: 4 CIE: 48 SEE: 80
SUBJECT 4 CREDITS: 4 CIE: 45 SEE: 85
SUBJECT 5 CREDITS: 3 CIE: 50 SEE: 75
```

LP2 Observation:



```
WEEK 2

import java.util.Scanner;

Class student {

    private string usn, name;
    private int[] credits = new int [5];
    private int[] marks = new int [5] ;
    private int[] grade = new int [5];

    void accept () {

        Scanner sc = new Scanner (System.in);
        System.out.print ("Enter your name");
        this.name = sc.nextLine();

        system.out.print ("Enter your usn:");
        this.USN = sc.next();
        System.out.print ("
        for( int i = 0; i < credits.length ; i++) {

            System.out.print ("Enter marks in subject" + (i+1) + ":
            this . marks [i] = sc.nextInt();

            system.out.print ("Enter credits in subject" + (i+1) + ":
            this. credits [i] = sc.nextInt();

            system.out.println();

        }

    void display() {

        System.out.println("Here are your details:");
        system.out.println ("USN:" + usn);
        System.out.println ("Name:" + name);
        for (int i = 0; i < credits.length ; i++) {
        {   system.out.println("SUBJECT:" + (i+1) + "CREDITS:"
                                + credits[i] + "MARKS:" + marks[i]

        }

    }

    void gradeCalc() {
    for (int i = 0; i < marks.length ; i++) {
        if (marks[i] >=90)
            grade[i] = 10;
    else if (marks[i] >= 80 && marks[i] <90)
            grade[i] = 9;
    else if (marks[i] >= 70 && marks[i] <80)
            grade[i] = 8;
```

```
else if ( marks[i] >= 60 && marks[i] < 70)
    grade[i] = 7;
else if ( marks[i] >= 50 && marks[i] < 60)
    grade[i] = 6;
else if ( marks[i] >= 40 && marks[i] < 50)
    grade[i] = 4;
else
    grade[i] = 0;
  }
}
double sgpa(){
    double sum = 0, totalCred = 0;
    gradeCalc();
    for(int i = 0; i < credits.length; i++){
        sum += grade[i] * credits[i];
        totalCred += credits[i];
    }
    return sum/totalCred;
}
public static void main(String args[])
{
    Student std = new Student();
    std.accept();
    std.display();
    double gradept = std.sgpa();
    System.out.println("Your sgpa is:" + gradept);
  }
}
```

Expected o/p :- (for 2 subject input)

```
Enter your Name :- Medha Madhusudhan
Enter your USN : 1BM19EC074
Enter marks in subject 1 : 100
Enter credits of subject 1 : 4
Enter marks in subject 2 : 75
Enter credits of subject 2 : 3
Here are your details :-
USN :- 1BM19EC074
Name :- Medha Madhusudhan
Subject 1  credits : 4  marks : 100
Subject 2  credits : 3  marks : 75
Your SGPA is : 9.1428
```

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.

```java
import java.util.Scanner;

class Book{
    private String name,author;
    private double price;
    private int num_pages;

    Book(){
        this.name = "";
        this.author = "";
        this.price = 0.0;
        this.num_pages = 0;
    }

    public void setName(String n){
        this.name = n;
    }
    public void setAuthor(String a){
        this.author = a;
    }
    public void setPrice(double p){
        this.price = p;
    }
    public void setPages(int q){
        this.num_pages = q;
    }

    public String toString(){

        return "Name: " + this.name + " Author:" + this.author + " Price:" + this.price + " No. of Pages:" + this.num_pages;

    }

    public String getName(){
        return this.name;
    }

    public String getAuthor(){
        return this.author;
    }

    public double getPrice(){
        return this.price;
    }
```

```
45
46      public int getPages(){
47          return this.num_pages;
48      }
49
50      public static void main(String args[]){
51          int n;
52          Scanner sc = new Scanner(System.in);
53          System.out.print("How may book details do you want to enter: ");
54          n = sc.nextInt();
55          Book[] b = new Book[n];
56
57          for(int i=0;i<n;i++){
58              b[i] = new Book();
59              System.out.println("Enter Details for Book  "+(i+1));
60
61              System.out.print("Enter Name: ");
62              b[i].setName(sc.next());
63
64              System.out.print("Enter Author: ");
65              b[i].setAuthor(sc.next());
66
67              System.out.print("Enter Price: ");
68              b[i].setPrice(sc.nextDouble());
69
70              System.out.print("Enter no. of pages: ");
71              b[i].setPages(sc.nextInt());
72          }
73
74          for(int i=0;i<n;i++){
75              System.out.println("Book "+(i+1));
76              String st = b[i].toString();
77              System.out.println(st);
78          }
79
80      }
81
82  }
```

```
Process started (PID=21848) >>>
How may book details do you want to enter: 1
Enter Details for Book  1
Enter Name: book1
Enter Author: author1
Enter Price: 45
Enter no. of pages: 100
Book 1
Name: book1 Author:author1 Price:45.0 No. of Pages:100
<<< Process finished (PID=21848). (Exit code 0)
================ READY ================
```

LP3 Observation:

```
{ WEEK - 3 }

import java.util.Scanner;

class Book{

    private string name, author;
    private double price;
    private int num_pages;

    Book() {
        this.name = "";
        this.author = "";
        this.price = 0.0;
        this.num_pages = 0;
    }

    public void setName (String n) {
        this.name = n;
    }
    public void setAuthor (String a) {
        this.author = a;
    }
    public void setPrice (double p) {
        this.price = p;
    }
    public void setPages (int q) {
        this.num_pages = q;
    }
    public string toString () {
    return "Name:" + this.name + " Author:" + this.author + " Price:" + this.pri
                    + " No.of Pages :" + this.num_Pages;

    }
    public string getName () {
        return this.name;
    }
    public string getAuthor() {
        return this.author;
    }
    public double getPrice() {
        return this.price;
    }
    public int getPages() {
        return this.num_Pages;
    }
```

```
public static void main (String[] args) {
    int n;
    Scanner sc = new Scanner(System.in);
    System.out.print("How many Book Details do you want to enter? ");
    n = sc.nextInt();
    Book[] b = new Book[n];

    for(int i=0; i<n; i++) {
        b[i] = new Book();
        System.out.println("Enter details for book"+(i+1));

        System.out.print("Enter name: ");
        b[i].setName(sc.next());

        System.out.print("Enter author: ");
        b[i].setAuthor(sc.next());

        System.out.print("Enter price: ");
        b[i].setPrice(sc.nextDouble());
        System.out.print("Enter no. of pages:");
        b[i].setPages(sc.nextInt());
    }
    for(int i=0; i<n; i++) {
        System.out.println("Book "+(i+1));
        String st = b[i].toString();
        System.out.println(st);
    }

}
}
```

Expected o/p:-

```
How many books do you want to enter: 1
Enter details for book 1
Enter name: b1
Enter author: a1
Enter price: 25
Enter no. of pages:- 99
Book 1
Name: b1 Author a1 Price 25.0 no. of pages: 99
```

Lab Program 4:

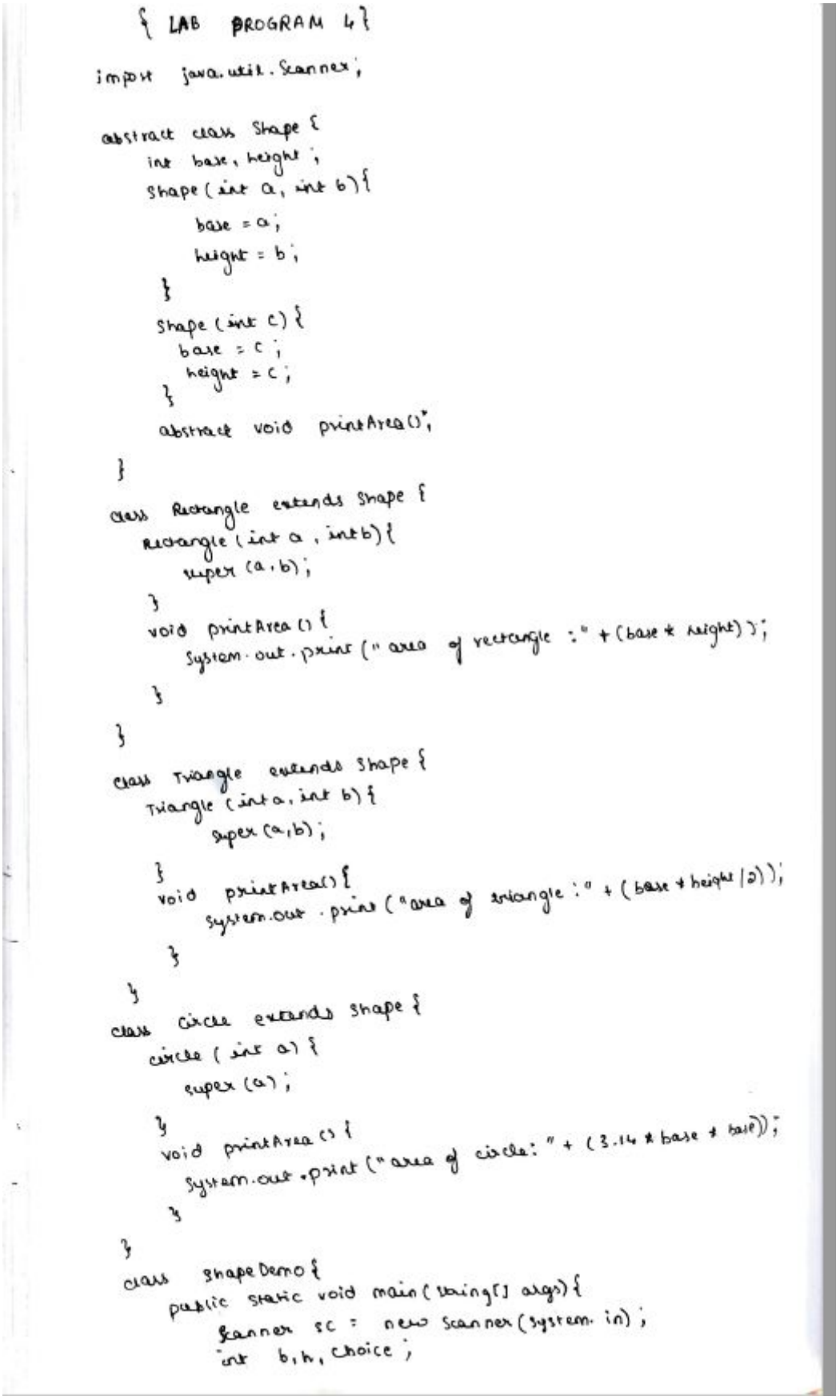
Develop a Java program to create an abstract class named Shape that contains two integers and an empty method named printArea( ). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contain only the method printArea(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

```
import java.util.Scanner;

abstract class Shape{
    int base,height;
    Shape(int a,int b){
        base = a;
        height = b;
    }
    Shape(int c){
        base = c;
        height = c;
    }
    abstract void printArea();
}

class Rectangle extends Shape{
    Rectangle(int a,int b){
        super(a,b);
    }
    void printArea(){
        System.out.print("area of rectangle: " + (base*height));
    }
}
class Triangle extends Shape{
    Triangle(int a,int b){
        super(a,b);
    }
    void printArea(){
        System.out.print("area of triangle: " + (base*height/2));
    }
}
class circle extends Shape{
    circle(int a){
        super(a);
    }
    void printArea(){
        System.out.print("area of circle: " + (3.14*base*base));
    }
}

class ShapeDemo{
    public static void main(String args[]){
        Scanner sc = new Scanner(System.in);
        int b,h,choice;
```

```
        while(true){
            System.out.print("\nEnter choice 1.Rectangle 2.triangle 3.circle 4.exit: ");
            choice = sc.nextInt();

            switch(choice){
                case 1:System.out.print("Enter base: ");
                   b = sc.nextInt();
                   System.out.print("Enter height: ");
                   h = sc.nextInt();
                   Rectangle r = new Rectangle(b,h);
                   r.printArea();
                   break;

                case 2:System.out.print("Enter base: ");
                   b = sc.nextInt();
                   System.out.print("Enter height: ");
                   h = sc.nextInt();
                   Triangle t = new Triangle(b,h);
                   t.printArea();
                   break;

                case 3:System.out.print("Enter radius: ");
                   b = sc.nextInt();
                   circle ci = new circle(b);
                   ci.printArea();
                   break;

                case 4:System.exit(0);
            }
        }
    }
}
```

```
Enter choice 1.Rectangle 2.triangle 3.circle 4.exit: 1
Enter base: 7
Enter height: 7
area of rectangle: 49
Enter choice 1.Rectangle 2.triangle 3.circle 4.exit: 3
Enter radius: 7
area of circle: 153.86
Enter choice 1.Rectangle 2.triangle 3.circle 4.exit:
```

LP4 Observation:



```
{ LAB PROGRAM 4}

import java.util.Scanner;

abstract class Shape {
    int base, height;
    Shape(int a, int b){
        base = a;
        height = b;
    }
    Shape(int c) {
      base = c;
      height = c;
    }
    abstract void printArea();
}
class Rectangle extends Shape {
   Rectangle(int a, int b){
      super(a,b);
    }
    void printArea() {
       System.out.print("area of rectangle :" + (base * height));
    }
}
class Triangle extends Shape {
   Triangle(int a, int b) {
        super(a,b);
    }
    void printArea() {
       System.out.print("area of triangle :" + (base * height/2));
    }
}
class Circle extends Shape {
   Circle(int a) {
      super(a);
    }
    void printArea() {
      System.out.print("area of circle: " + (3.14 * base * base));
    }
}
class ShapeDemo {
    public static void main(String[] args){
        Scanner sc = new Scanner(System.in);
        int b,h, choice;
```

```
while (
    System.out.print("\nEnter choice 1.Rectangle 2.Triangle 3.circle
                                        4.exit: ");
    choice = sc.nextInt();

    switch(choice){
        case 1: System.out.print("Enter base: ");
                b= sc.nextInt();
                System.out.print("Enter height:");
                h = sc.nextInt();
                Rectangle r = new Rectangle(b,h);
                r.printArea();
                break;
        case 2: System.out.print("Enter base: ");
                b = sc.nextInt();
                System.out.print("Enter height:");
                h = sc.nextInt();
                Triangle t = new Triangle(b,h);
                t.printArea();
                break;
        case 3: System.out.print("Enter radius:");
                b= sc.nextInt();
                circle ci = new circle(b);
                ci.printArea();
                break;
        case 4: System.exit(0);
    }
  }
}
```

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 Curr-acct and Sav-acct to make them more specific to their requirements. Include the necessary methods in order to achieve the following tasks:
Accept deposit from customer and update the balance.

- Display the balance.
- Compute and deposit interest
- Permit withdrawal and update the balance
- Check for the minimum balance, impose a penalty if necessary and update the balance.

```
import java.util.Scanner;
import java.lang.Math;

class account{
    double balance;
    String customer_name;
    int account_number;
    char account_type; //s for savings,c for current

    account(String name,int num,char type){
        customer_name = name;
        account_number = num;
        account_type = type;
        balance = 500;
    }

    String retAcctType(){
        if(account_type == 'S' || account_type == 's')
            return "Savings";
        else if(account_type == 'C' || account_type == 'c')
            return "Current";
        else
            return "None";
    }
    void display(){
        System.out.println("\nHere are your details: "+"\nName: "+customer_name +"\naccount number: "+account_number+"\naccount type: "+retAcctType());
    }

}
class Curr_acct extends account{
    boolean check;
    double penalty=50.0,min_balance=400.0;

    Curr_acct(String name,int num,char type,boolean cheque){
        super(name,num,type);
        check = cheque;
    }
    char checkOption(){
        if(check)
            return 'Y';
        else
            return 'N';
    }
    double Addpenalty(){
```

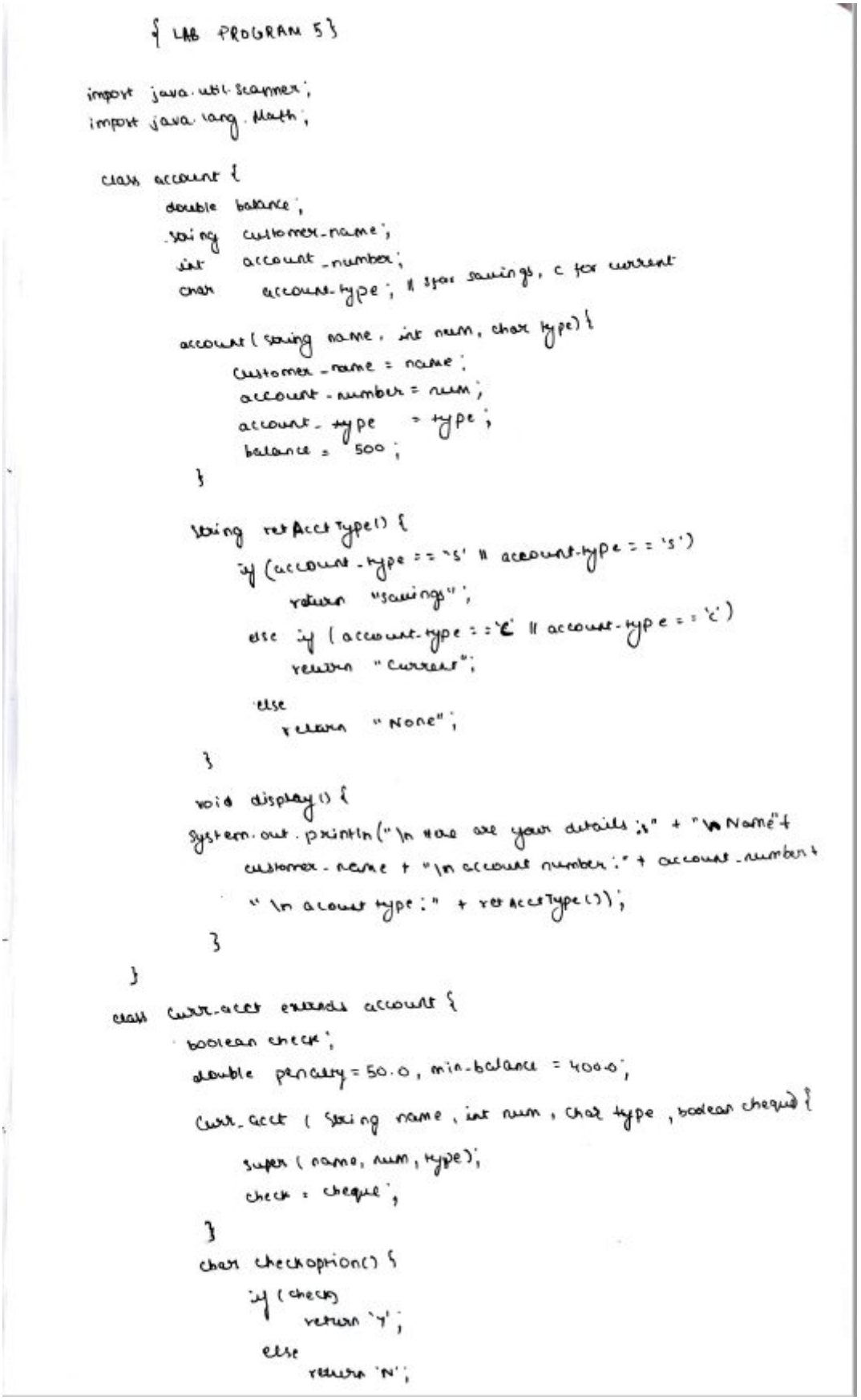
```
            balance = balance - penalty;
        return balance;
    }

    double updateBalance(double n){
        balance = Addpenalty();
        balance = balance + n;
        return balance;
    }
    void displayBalance(){
        balance = Addpenalty();
        System.out.println("your balance: " + balance);
    }
    void displayMin(){
        System.out.println("minimum balance: " + min_balance +" Penalty: "+ penalty);
    }

}
class Sav_acct extends account{
    int interest_rate;

    Sav_acct(String name,int num,char type){
        super(name,num,type);
        interest_rate = 5;
    }
    double calcInterest(int n,int t){
        double val;
        val = Math.pow(1 + (double)interest_rate/(n*100),n*t);
        return balance*(val - 1);
    }
    double depositInterest(int n,int t){
        balance = balance*Math.pow(1 + (double)interest_rate/(n*100),n*t);
        return balance;
    }
}

class BankDemo{
    public static void main(String[] args){
        Scanner sc = new Scanner(System.in);
        int choice,b;
        String a;
        char c,bool;
        boolean d;
        System.out.print("Enter your name: ");
```

```
        a = sc.next();
        System.out.print("Enter your Account number: ");
        b = sc.nextInt();
        System.out.print("Enter your account type(s for savings,c for current): ");
        c = sc.next().charAt(0);

        if(c == 'c' || c =='C'){
            System.out.print("Do you want cheque option(y/n)?");
            bool = sc.next().charAt(0);
            if(bool == 'Y'|| bool == 'y')
                d = true;
            else
                d = false;

            Curr_acct a1 = new Curr_acct(a,b,c,d);
            a1.display();

            while(true){
                double x;
                System.out.println("\nEnter your choice:\n1.deposit\n2.display balance(after penalty,if applicabe)\n3.withdraw\n4.check min. balance and penalty\n5.exit ");
                choice = sc.nextInt();
                switch(choice){
                    case 1:System.out.print("How much do you want to deposit?");
                           x = sc.nextDouble();
                           System.out.print("Balance has been updated to Rs." + a1.updateBalance(x));
                           break;
                    case 2:a1.displayBalance();
                           break;
                    case 3:System.out.print("How much do you want to withdraw?");
                           x = sc.nextDouble();
                           System.out.print("Balance has been updated to Rs." + a1.updateBalance(-x));
                           break;
                    case 4:a1.displayMin();
                           break;
                    case 5:System.exit(0);
                }
            }
        }
        else if(c == 's' || c == 'S'){
            Sav_acct a2 = new Sav_acct(a,b,c);
            a2.display();

            while(true){
                int p,q;
```

```
129             Sav_acct a2 = new Sav_acct(a,b,c);
130             a2.display();
131
132             while(true){
133                 int p,q;
134                 System.out.println("\nEnter your choice:\n1.compute interest\n2.deposit interest\n3.exit");
135                 choice = sc.nextInt();
136                 switch(choice){
137                     case 1:System.out.print("Enter n(per time period): ");
138                            p = sc.nextInt();
139                            System.out.print("Enter time period in years: ");
140                            q = sc.nextInt();
141                            System.out.print("Interest amt. for interest rate of 5% is: " + a2.calcInterest(p,q));
142                            break;
143                     case 2:System.out.print("Enter n(per time period): ");
144                            p = sc.nextInt();
145                            System.out.print("Enter time period: ");
146                            q = sc.nextInt();
147                            System.out.print("Balance has been updated to Rs." + a2.depositInterest(p,q));
148                            break;
149                     case 3:System.exit(0);
150                 }
151             }
152         }
153         else
154             System.exit(0);
155     }
156 }
```

```
Process started (PID=24568) >>>
Enter your name: medha
Enter your Account number: 12345
Enter your account type(s for savings,c for current): s

Here are your details:
Name: medha
account number: 12345
account type: Savings

Enter your choice:
1.compute interest
2.deposit interest
3.exit
1
Enter n(per time period): 3
Enter time period in years: 5
Interest amt. for interest rate of 5% is: 140.69122185850534
Enter your choice:
1.compute interest
2.deposit interest
3.exit
```

LP5 Observation:



```
{ LAB PROGRAM 5}

import java.util.Scanner;
import java.lang.Math;

class account {
    double balance;
    String customer_name;
    int account_number;
    char account_type; // s for savings, c for current

    account(String name, int num, char type){
        customer_name = name;
        account_number = num;
        account_type = type;
        balance = 500;
    }

    String retAccType() {
        if (account_type == 's' || account_type == 'S')
            return "savings";
        else if (account_type == 'c' || account_type == 'C')
            return "Current";
        else
            return "None";
    }

    void display() {
    System.out.println("\n Here are your details :\" + "\n Name"+
        customer_name + "\n account number :" + account_number+
        "\n account type :" + retAccType());
    }
}
class Curr_acct extends account {
    boolean check;
    double penalty=50.0, min_balance = 400.0;

    Curr_acct ( String name, int num, char type, boolean cheque){
        super (name, num, type);
        check = cheque;
    }
    char checkoption() {
        if (check)
            return 'Y';
        else
            return 'N';
```

```
double Addpenalty() {
    if (balance <= 400)
        balance = balance - penalty;
    return balance;
}
double updateBalance (double n) {
    balance = Addpenalty();
    System.o
    balance = balance + n;
    return balance;
}
void displayBalance() {
    balance = Addpenalty();
    System.out.println("Your balance:" + balance);
}
void displayMin () {
    System.out.println("minBalance" + min_balance + "Penalty:" +
                                                    penalty);
}
}
class Sav_acct extends account {
    int interest_rate;
    Sav_acct (String name, int num, char type) {
        super (name, num, type);
        interest_rate = 5;
    }
    double calcInterest (int n, int t) {
        double val;
        val = Math.pow (1+(double) interest_rate/(n*100), n*t);
        return balance;
    }
}

class BankDemo {
    public static void main(String[] args) {
        Scanner sc = new Scanner (System.in);
        int choice, n;
        String a;
        char c, bool;
        boolean d;
        system.out.print ("Enter your name:");
```

```
a = sc.next();
System.out.print("Enter your account number: ");
b= sc.nextInt();
System.out.print("Enter acct type (S for savings, C for current)");
c= sc.next().charAt(0);

if (c=='c' || c=='C') {
    System.out.print("Do you want check option (Y|N) ?");
    bool = sc.next().charAt(0);
    if (bool=='Y' || bool=='y')
        d = true;
    else
        d = false;
    Customer_acct a1 = new Cust_acct(a,b,c,d);
    a1.display();
    while (true) {
        double x;
        System.out.println("\nEnter your choice:\n1.deposit\n
          2.display balance (after penalty, if applicable) \n3.
          withdraw \n4. check min balance and penalty \n5.
          exit");
        choice = sc.nextInt();
        switch(choice) {
          case 1: System.out.print("How much do you want to
                    deposit ?");
                  x = sc.nextDouble;
                  System.out.print("Balance has been update
                    to:" + a1.updateBalance(x));
                  break;
          case 2: a1.displayBalance();
                  break;
          Case 3: System.out.print("How much do you want
                    to withdraw?");
                  x = sc.nextDouble();
                  System.out.print("Balance has been update
                    to Rs." + a1.updateBalance(-x));
                  break;
          Case 4: a1.displayMin();
                  break;
          Case 5: System.exit(0);
        }
    }
}
```

```
else  if (c == 'S' || c == 's') {
      Saving_Acct a2 = new Saving_Acct(a,b,c);
      a2.display();
      while (true) {
          int p,q;
          System.out.println("\nEnter choice: \n1. compute interest \n2.
                  deposit interest \n3. exit");
          choice = sc.nextInt();
        switch(choice){
          int p,q;
           case 1: System.out.print("Enter n(per time period):");
                   p = sc.nextInt();
                   System.out.print("Enter time period in years:");
                   q = sc.nextInt();
                   System.out.println("Interest amt. for interest
                   rate of 5% is:" + a2.calcInterest(p,q));
                   break;
           case 2: System.out.print("Enter n(per time period):");
                   p= sc.nextInt();
                   System.out.print("Enter time period:");
                   q = sc.nextInt();
                   System.out.print("Balance has been updated
                   to Rs." + a2.depositInterest(p,q));
                   break;
            case 3: System.exit(0);
          }
        }
      }
      else
        System.exit(0);
    }
```

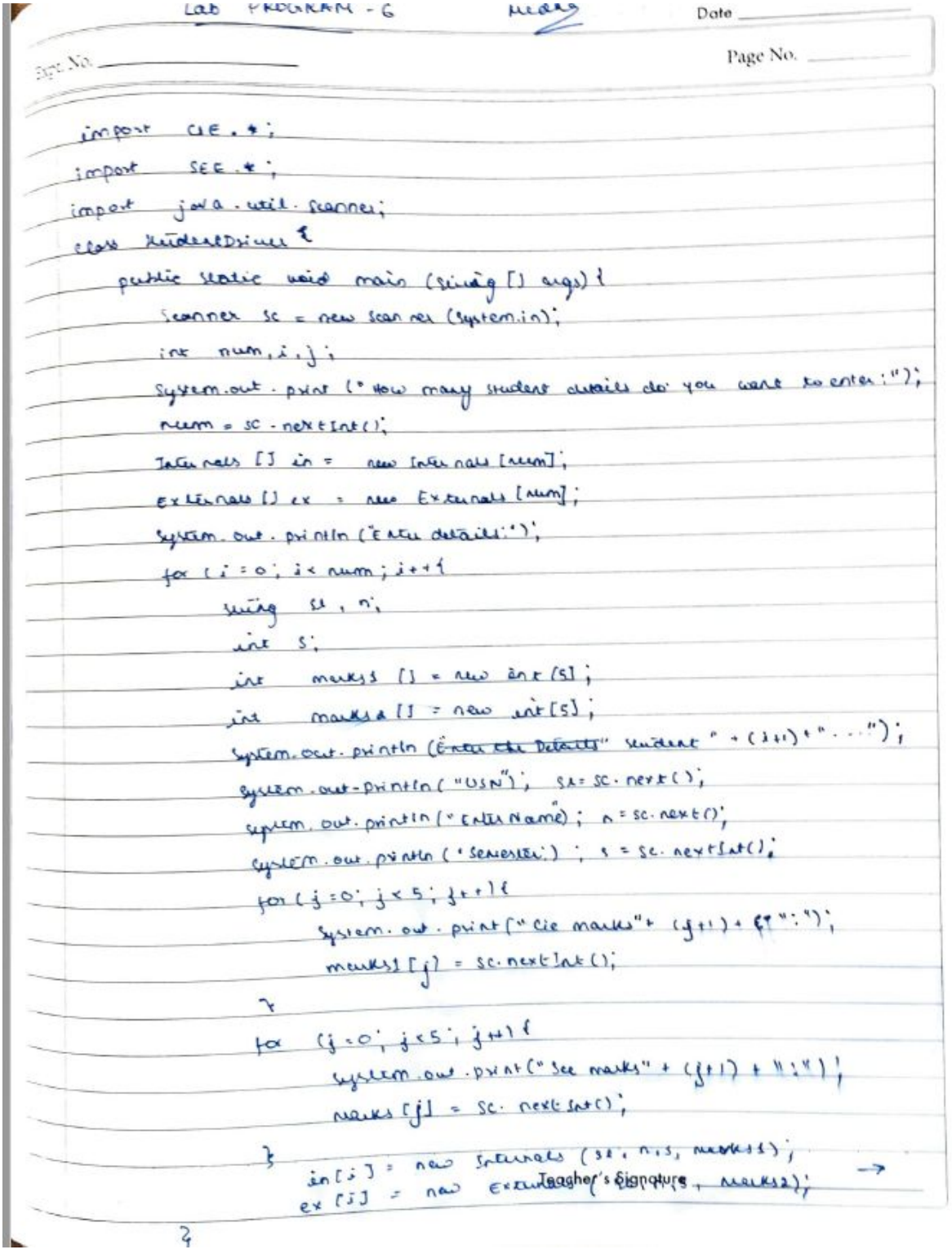
Lab Program 6

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.

```java
//driver class
import CIE.*;
import SEE.*;
import java.util.Scanner;
class StudentDriver{
    public static void main(String[] args){
        Scanner sc = new Scanner(System.in);
        int num,i,j;
        System.out.print("How many student details do you want to enter: ");
        num = sc.nextInt();
        Internals[] in = new Internals[num];
        Externals[] ex = new Externals[num];
        System.out.println("Enter the details: ");
        for(i=0;i<num;i++){
            String sl,n;
            int s;
            int marks1[] = new int[5];
            int marks2[] = new int[5];
            System.out.println("---Student "+(i+1)+"---");
            System.out.print("Enter USN: ");
            sl = sc.next();
            System.out.print("Enter Name: ");
            n = sc.next();
            System.out.print("Enter Semester: ");
            s = sc.nextInt();
            for(j=0;j<5;j++){
                System.out.print("Cie marks "+(j+1)+" : ");
                marks1[j] = sc.nextInt();
            }
            for(j=0;j<5;j++){
                System.out.print("See marks "+(j+1)+" : ");
                marks2[j] = sc.nextInt();
            }
            in[i] = new Internals(sl,n,s,marks1);
            ex[i] = new Externals(sl,n,s,marks2);
        }
        System.out.println("Here are your details: ");
        for(i=0;i<num;i++){
            System.out.println("---Student "+(i+1)+"---");
            in[i].displayStudent();
            for(j=0;j<5;j++){
                System.out.println("marks in subject "+(j+1)+" : "+(in[i].cie_marks[j]+ex[i].see_marks[j]/2));
            }
        }
```

```
How many student details do you want to enter: 1
Enter the details:
---Student 1---
Enter USN: 12345
Enter Name: medha
Enter Semester: 3
Cie marks 1 : 45
Cie marks 2 : 45
Cie marks 3 : 45
Cie marks 4 : 45
Cie marks 5 : 45
See marks 1 : 90
See marks 2 : 90
See marks 3 : 90
See marks 4 : 90
See marks 5 : 90
Here are your details:
---Student 1---
Name: medha USN: 12345 Semester: 3
marks in subject 1 : 90
marks in subject 2 : 90
marks in subject 3 : 90
marks in subject 4 : 90
marks in subject 5 : 90
<<< Process finished (PID=21568). (Exit code 0)
================ READY ================
```

LP6 Observation:



Lab PROGRAM - 6 Marks

Date

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```
import CIE.*;
import SEE.*;
import java.util.Scanner;
class StudentDriver{
    public static void main (String [] args){
    Scanner sc = new Scanner (System.in);
    int num, i, j;
    System.out.print ("How many students details do you want to enter:");
    num = sc.nextInt();
    Internals [] in = new Internals [num];
    Externals [] ex = new Externals [num];
    System.out.println ("Enter details:");
    for (i=0; i<num; i++){
        String st, n;
        int s;
        int marks [] = new int [5];
        int marks2 [] = new int [5];
        System.out.println ("Enter the details of student " + (i+1) + "....");
        System.out.println ("USN"); st= sc.next();
        System.out.println ("Enter Name"); n = sc.next();
        System.out.println ("Semester:"); s = sc.nextInt();
        for (j=0; j<5; j++){
            System.out.print ("Cie marks" + (j+1) + ":");
            marks[j] = sc.nextInt();
        }
        for (j=0; j<5; j++){
            System.out.print ("See marks" + (j+1) + ":");
            marks [j] = sc.nextInt();
        }
        in[i] = new Internals (st, n, s, marks);
        ex [i] = new Externals (st, n, s, marks2);
    }
}
```

Teacher's Signature

```
System.out.println("Here are your details:");
for(i=0; i<num; i++) {
        System.out.println("---Student " + (i+1) + "----");
        in[i].displayStudent();
        for(j=0; j<5; j++) {
            System.out.println("marks in sub" + (j+1) + ":" +
                    (in[i].sie_marks[j] + ev[i].see_marks[j]/2));
        }
    }
  }
}
```

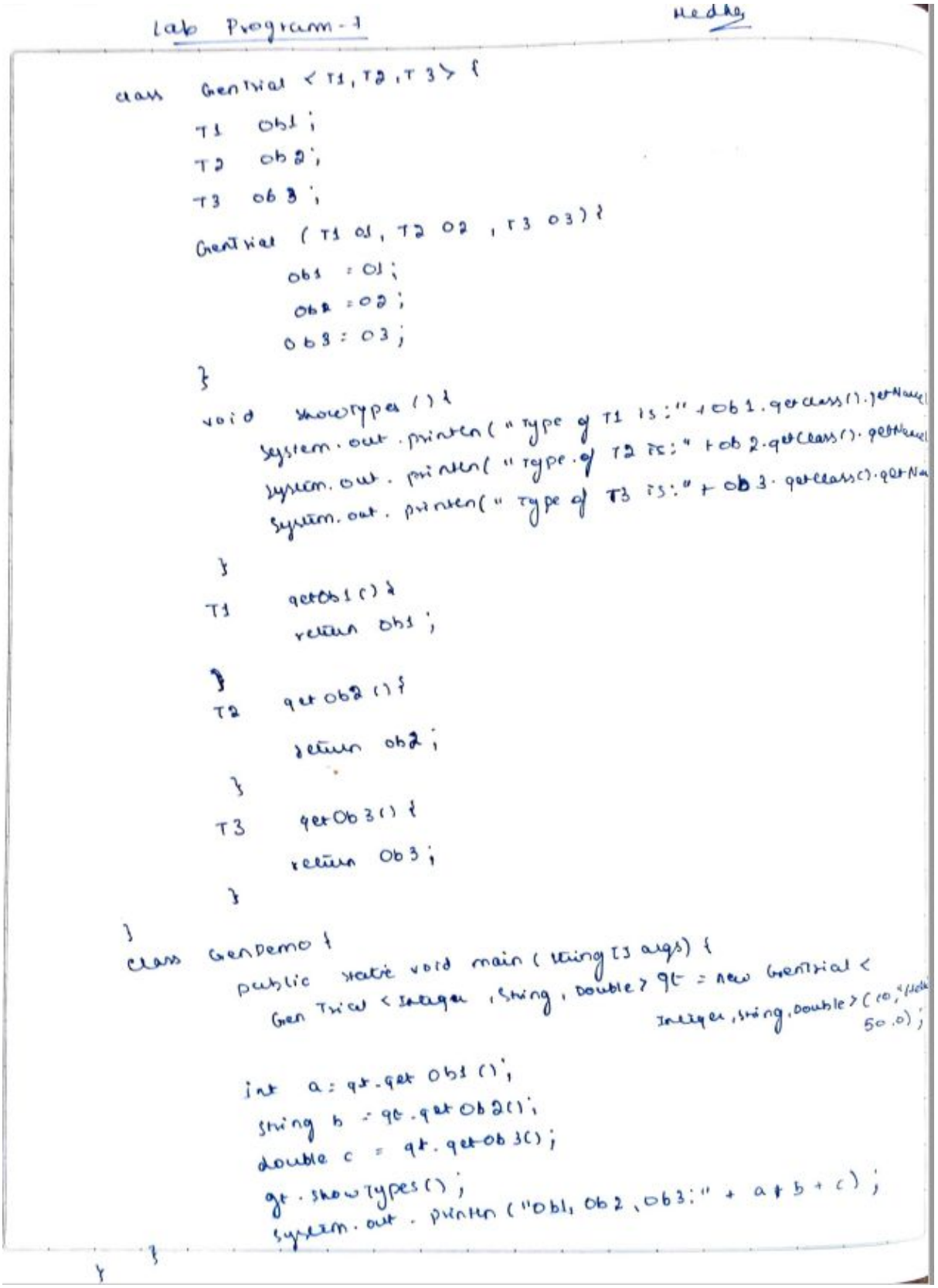
Lab Program 7

Write a program to demonstrate generics with multiple object parameters.

```
//Generic class Demo:

class GenTrial<T1,T2,T3>{
    T1 ob1;
    T2 ob2;
    T3 ob3;

    GenTrial(T1 o1,T2 o2,T3 o3){
        ob1 = o1;
        ob2 = o2;
        ob3 = o3;
    }

    void showTypes(){
        System.out.println("Type of T1 is " +ob1.getClass().getName());
        System.out.println("Type of T2 is " +ob2.getClass().getName());
        System.out.println("Type of T3 is " +ob3.getClass().getName());
    }

    T1 getOb1(){
        return ob1;
    }

    T2 getOb2(){
        return ob2;
    }

    T3 getOb3(){
        return ob3;
    }
}

class GenDemo{
    public static void main(String[] args){
        GenTrial<Integer,String,Double> gt = new GenTrial<Integer,String,Double>(10,"Hello",50.0);
        int a = gt.getOb1();
        String b = gt.getOb2();
        double c = gt.getOb3();
        gt.showTypes();
        System.out.println("Values of Ob1,Ob2,Ob3 are respectively: "+ a +" , "+ b + " , " + c);
    }
}

```

```
Process started (PID=20796) >>>
Type of T1 is java.lang.Integer
Type of T2 is java.lang.String
Type of T3 is java.lang.Double
Values of Ob1,Ob2,Ob3 are respectively: 10 , Hello , 50.0
<<< Process finished (PID=20796). (Exit code 0)
```

LP7 Observation:



Lab Program-7

Hedha

```
class GenTrial <T1, T2, T3> {
    T1 obj1;
    T2 obj2;
    T3 obj3;
    GenTrial (T1 o1, T2 o2, T3 o3) {
        obj1 = o1;
        obj2 = o2;
        obj3 = o3;
    }
    void showTypes () {
        System.out.println("Type of T1 is:" + ob1.getClass().getName()
        System.out.println("Type of T2 is:" + ob2.getClass().getName()
        System.out.println("Type of T3 is:" + ob3.getClass().getName
    }
    T1 getObj1 () {
        return obj1;
    }
    T2 getObj2 () {
        return obj2;
    }
    T3 getObj3 () {
        return Obj3;
    }
}
class GenDemo {
    public static void main (String[] args) {
        GenTrial <Integer, String, Double> gt = new GenTrial <
                Integer, String, Double> (10, "Hello
                50.0);
        int a = gt.getObj1 ();
        String b = gt.getObj2();
        Double c = gt.getObj3();
        gt.showTypes();
        System.out.println("Obj1, Obj2, Obj3:" + a + b + c);
    }
}
```

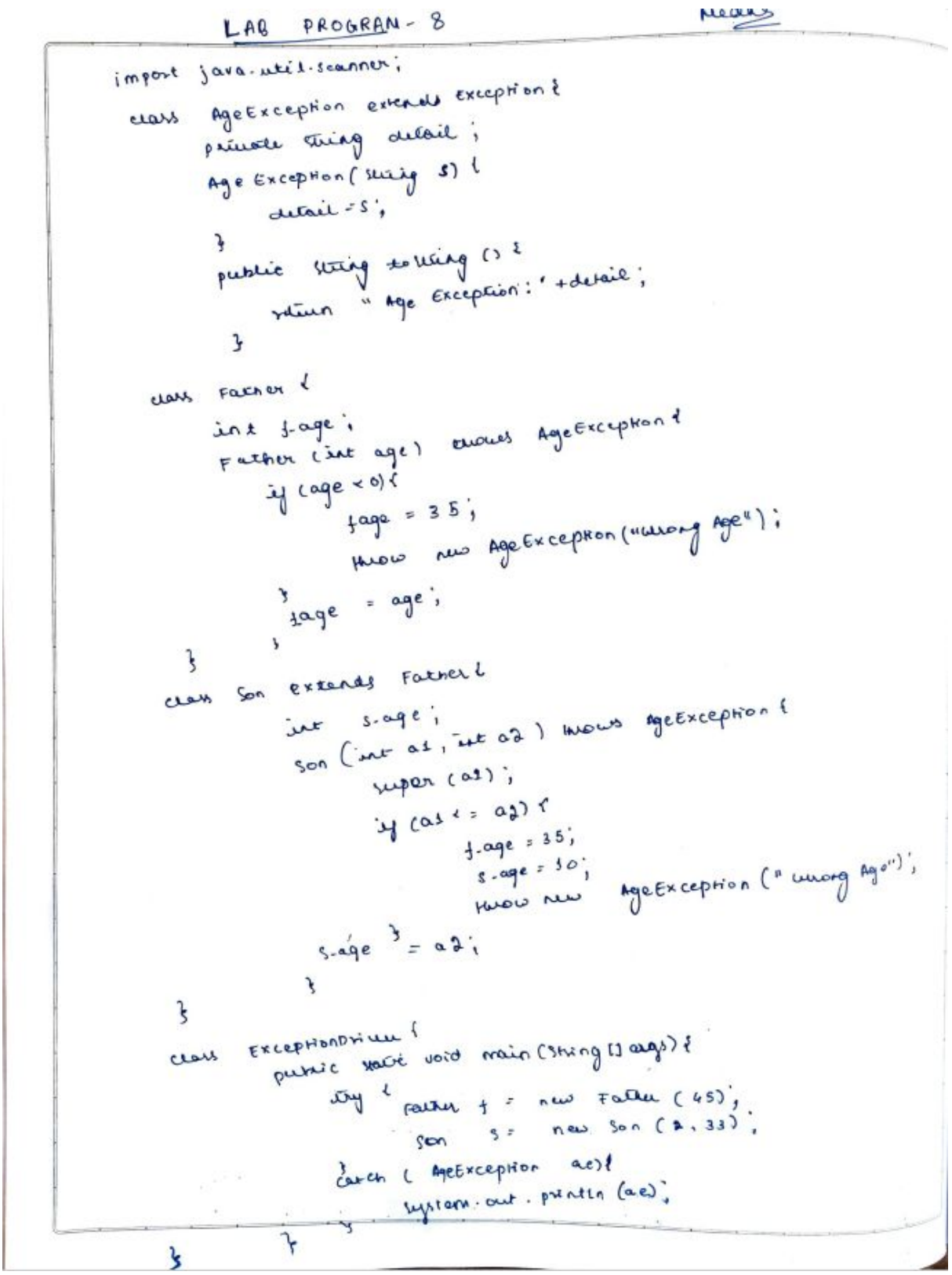
Lab Program 8

Write a program that demonstrates handling of exceptions in the inheritance tree. Create a base class called “Father” and a derived class called “Son” which extends the base class. In Father class, implement a constructor which takes the age and throws the exception Wrong Age( ) 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.

```
3  class AgeException extends Exception{
4      private String detail;
5      AgeException(String s){
6          detail = s;
7      }
8      public String toString(){
9          return "Age Exception: " + detail;
10     }
11 }
12 class Father{
13     int f_age;
14     Father(int age) throws AgeException{
15         if(age < 0){
16             f_age = 35;
17             throw new AgeException("Wrong Age");
18         }
19         f_age = age;
20     }
21 }
22 class Son extends Father{
23     int s_age;
24     Son(int a1,int a2) throws AgeException{
25         super(a1);
26         if(a1 <= a2){
27             f_age = 35;
28             s_age = 10;
29             throw new AgeException("Son's age greater than/equal to Father's age");
30         }
31         s_age = a2;
32     }
33 }
34 class ExceptionsDriver{
35     public static void main(String[] args){
36         try{
37             Father f = new Father(45);
38             Son s = new Son(2,33);
39         }
40         catch(AgeException ae){
41             System.out.println(ae);
42         }
43         finally{
44             System.out.println("All have been checked");
45         }
46     }
```

```
<<< Process finished (PID=23372). (Exit code 0)
"C:\java\bin\java" -classpath "C:\Users\Madhusudhan\OneDrive\Desktop\JavaProgs\LabTest2" ExceptionsDriver
Process started (PID=20032) >>>
Age Exception: Son's age greater than/equal to Father's age
All have been checked
<<< Process finished (PID=20032). (Exit code 0)
================ READY ================
```

LP8 Observation:



```
LAB PROGRAM - 8

import java.util.Scanner;
class AgeException extends Exception {
    private String detail;
    AgeException(String s) {
        detail = s;
    }
    public String toString() {
        return "Age Exception: " + detail;
    }
}
class Father {
    int f_age;
    Father(int age) throws AgeException {
        if (age < 0) {
            f_age = 35;
            throw new AgeException("Wrong Age");
        }
        f_age = age;
    }
}
class Son extends Father {
    int s_age;
    Son(int a1, int a2) throws AgeException {
        super(a2);
        if (a1 <= a2) {
            f_age = 35;
            s_age = 10;
            throw new AgeException("Wrong Age");
        }
        s_age = a2;
    }
}
class ExceptionDriver {
    public static void main(String[] args) {
        try {
            Father f = new Father(45);
            Son s = new Son(2, 33);
        } catch (AgeException ae) {
            System.out.println(ae);
        }
    }
}
```

Lab Program 9

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.

```
//Lab Program 9
class NewThread implements Runnable{
    Thread t;
    NewThread(){
        t = new Thread(this,"CSE");
    }
    public void run(){
        try{
            for(int i=5;i>0;i--){
                System.out.println(t.getName());
                Thread.sleep(2000);
            }
        }
        catch(InterruptedException e){
            System.out.println("Interrupted: "+t.getName());
        }
        System.out.println("Exiting: "+t.getName());
    }
}
class Threads{
    public static void main(String[] args){
        NewThread nt = new NewThread();
        nt.t.start();
        try{
            for(int i=5;i>0;i--){
                System.out.println("BMS College of Engineering");
                Thread.sleep(10000);
            }
        }
        catch(InterruptedException e){
            System.out.println("Interrupted: BMSCE");
        }
        System.out.println("Exiting: BMSCE");
    }
}
```

```
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
Exiting: CSE
BMS College of Engineering
BMS College of Engineering
BMS College of Engineering
```

LP9 Observation:

Lab Program - 9

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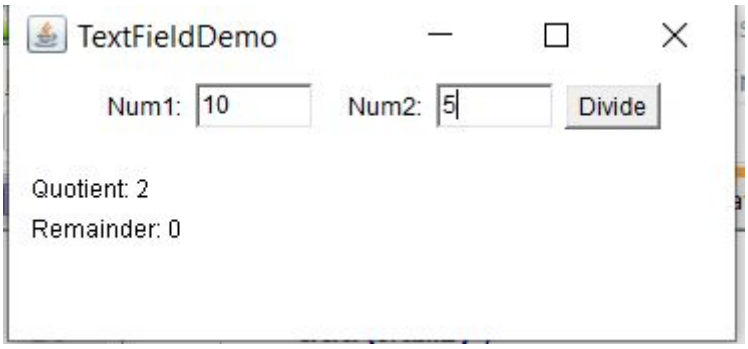
```
class NewThread implements Runnable{
    Thread t;
    NewThread (){
        t = new Thread(this, "CSE");
    }
    public void run (){
        try {
            for (int i=5; i>0; i--) {
                System.out.println (t.getName());
                Thread.sleep(8000);
            }
        }
        catch (InterruptedException e) {
            system.out.println("Interrupted :" t.getName());
        }
        System.out.println("Exiting" + t.getName());
    }
}
class Threads {
    public static void main(String[] args) {
        NewThread nt = new NewThread();
        nt.t.start();
        try {
            for (int i =5; i>0; i--) {
                system.out.println("BMS College of Engineering");
                Thread.sleep(10000);
            }
        } Catch (InterruptedException e) {
            system.out.println("Exiting: BMSCE");
        }
    }
}
```

Teacher's Signature _____

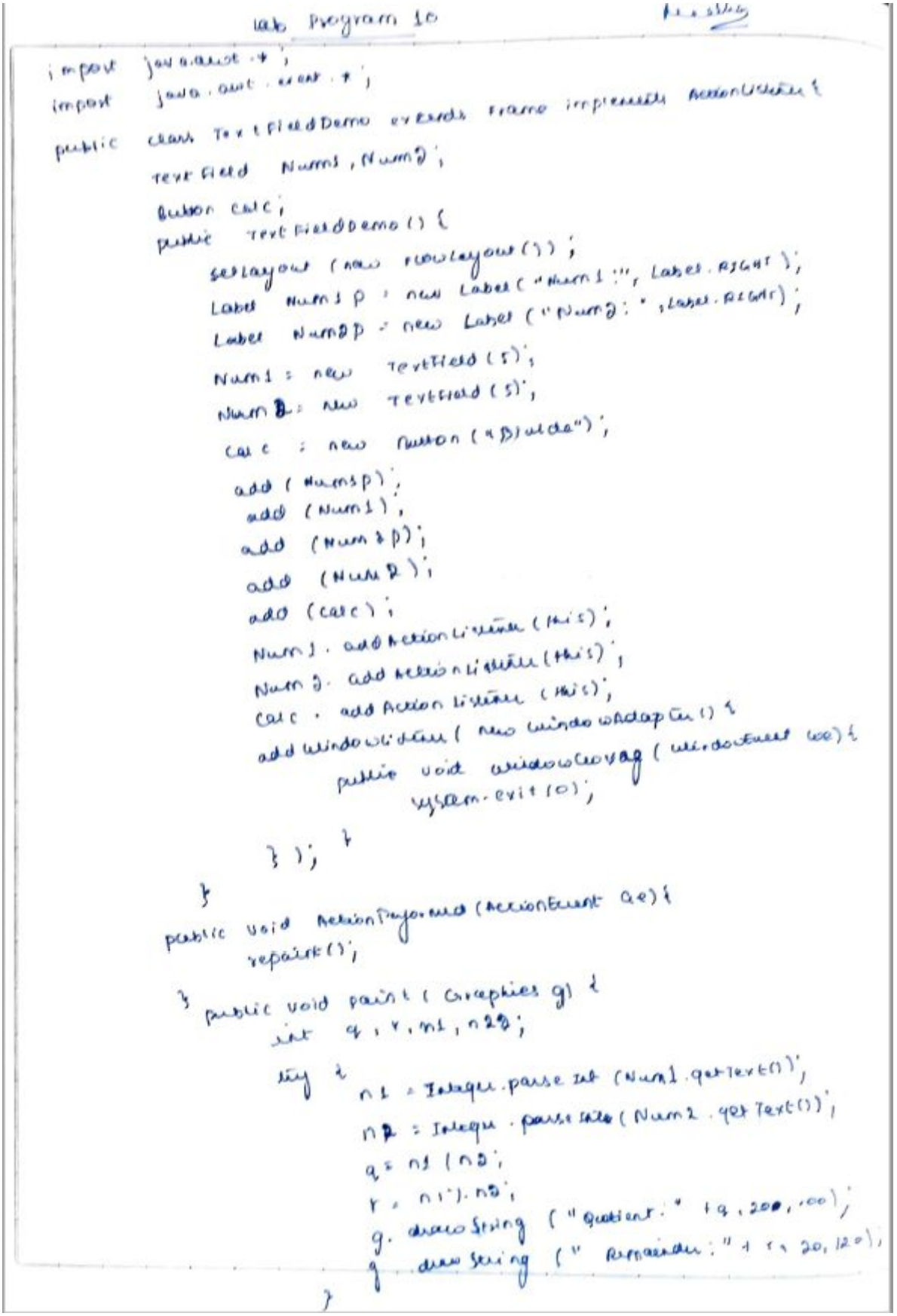
Lab Program 10

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.

```
1   //Lab Program 10
2   import java.awt.*;
3   import java.awt.event.*;
4
5   public class TextFieldDemo extends Frame implements ActionListener{
6       TextField Num1,Num2;
7       Button calc;
8       public TextFieldDemo(){
9           setLayout(new FlowLayout());
10          Label Num1p = new Label("Num1:",Label.RIGHT);
11          Label Num2p = new Label("Num2:",Label.RIGHT);
12          Num1 = new TextField(5);
13          Num2 = new TextField(5);
14          calc = new Button("Divide");
15          add(Num1p);
16          add(Num1);
17          add(Num2p);
18          add(Num2);
19          add(calc);
20          Num1.addActionListener(this);
21          Num2.addActionListener(this);
22          calc.addActionListener(this);
23          addWindowListener(new WindowAdapter(){
24              public void windowClosing(WindowEvent we){
25                  System.exit(0);
26              }
27          });
28      }
29      public void actionPerformed(ActionEvent ae){
30          repaint();
31      }
32      public void paint(Graphics g){
33          int q,r,n1,n2;
34          try{
35              n1 = Integer.parseInt(Num1.getText());
36              n2 = Integer.parseInt(Num2.getText());
37              q = n1/n2;
38              r = n1%n2;
39              g.drawString("Quotient: "+q,20,100);
40              g.drawString("Remainder: "+r,20,120);
41          }
42          catch(NumberFormatException e){
43              g.drawString(e.toString(),20,100);
44          }
45          catch(ArithmeticException e){
46              g.drawString(e.toString(),20,100);
47          }
48      }
49      public static void main(String args[]){
50          TextFieldDemo appwin = new TextFieldDemo();
51          appwin.setSize(new Dimension(380,180));
52          appwin.setTitle("TextFieldDemo");
53          appwin.setVisible(true);
54      }
55  }
```


TextFieldDemo
Num1: 10
Num2: 5
Divide
Quotient: 2
Remainder: 0

LP10 Observation:



Lab Program 10

```
import java.awt.*;
import java.awt.event.*;
public class TextFieldDemo extends Frame implements ActionListener {
    TextField Num1, Num2;
    Button calc;
    public TextFieldDemo() {
        setLayout(new FlowLayout());
        Label Num1p = new Label("Num1:", Label.RIGHT);
        Label Num2p = new Label("Num2:", Label.RIGHT);
        Num1 = new TextField(5);
        Num2 = new TextField(5);
        calc = new Button("Divide");
        add(Num1p);
        add(Num1);
        add(Num2p);
        add(Num2);
        add(calc);
        Num1.addActionListener(this);
        Num2.addActionListener(this);
        calc.addActionListener(this);
        addWindowListener(new WindowAdapter() {
            public void windowClosing(WindowEvent we) {
                System.exit(0);
            }
        });
    }
    public void actionPerformed(ActionEvent ae) {
        repaint();
    }
    public void paint(Graphics g) {
        int q, r, n1, n2;
        try {
            n1 = Integer.parseInt(Num1.getText());
            n2 = Integer.parseInt(Num2.getText());
            q = n1 / n2;
            r = n1 % n2;
            g.drawString("Quotient: " + q, 200, 100);
            g.drawString("Remainder: " + r, 20, 120);
        }
    }
```

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```
catch (NumberFormatException e) {
        g.drawString (e.toString(), 20, 100);
    }
catch (ArithmeticException e) {
        g.drawString (e.toString(), 20, 100);
    }
}

public static void main(String args[]) {
    TextFieldDemo appwin = new TextFieldDemo();
    appwin.setSize (new Dimension (380, 180));
    appwin.setTitle ("Text Field Demo");
    appwin.setVisible (true);
  }
}
```