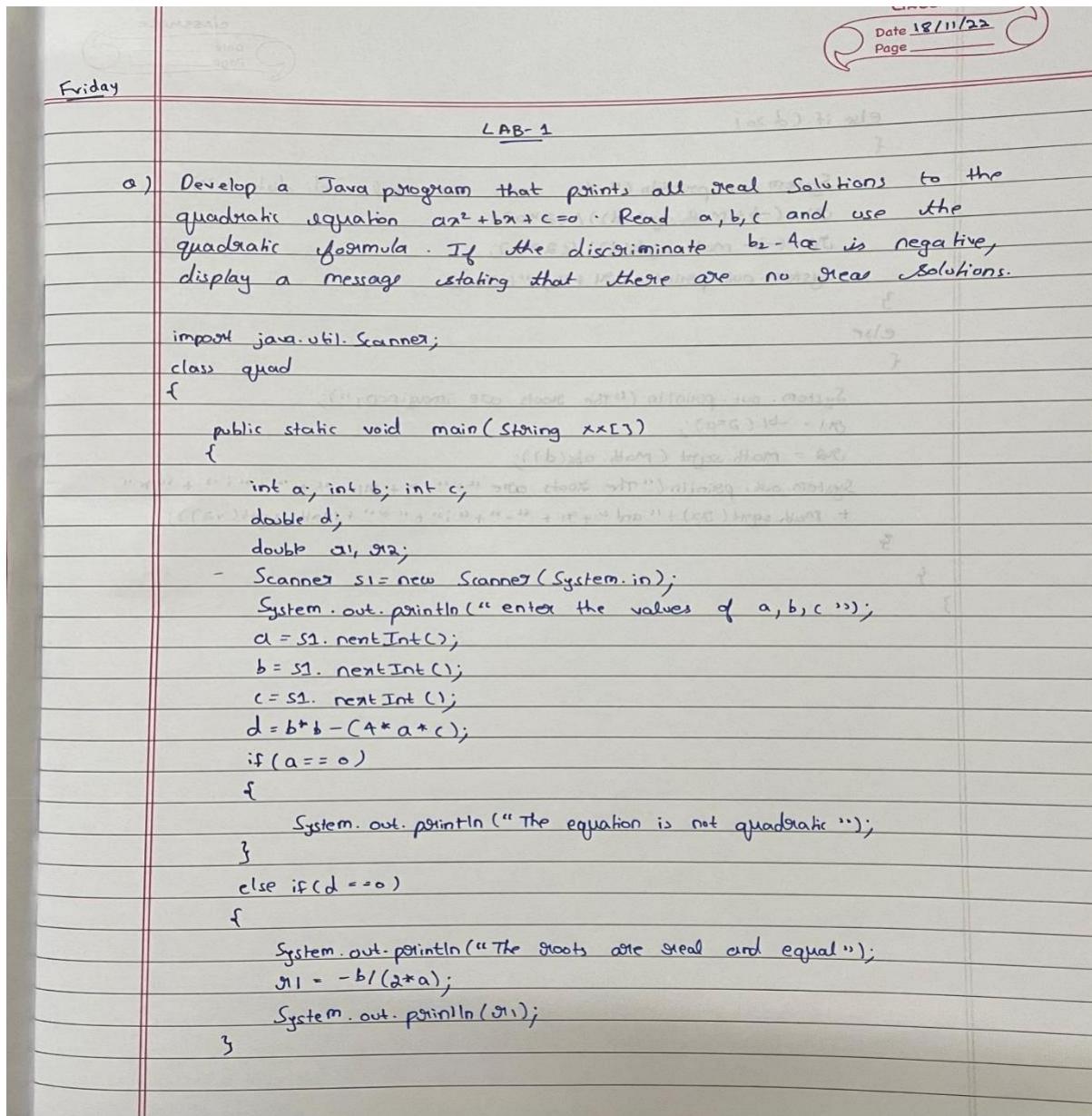


JAVA LAB RECORD

LAB PROGRAM 1 :

Develop a Java program that prints all real solutions to the quadratic equation $ax^2+bx+c = 0$. Read in a, b, c and use the quadratic formula. If the discriminate b^2-4ac is negative, display a message stating that there are no real solutions.

CODE SNIPPET :



```

else if (d > 0)
{
    System.out.println ("The roots are real and distinct");
    g1 = (-b + Math.sqrt(d)) / (2*a);
    g2 = (-b - Math.sqrt(d)) / (2*a);
    System.out.println (g1 + " , " + g2);
}
else
{
    System.out.println ("The roots are imaginary");
    g1 = -b / (2*a);
    g2 = Math.sqrt (Math.abs(d));
    System.out.println ("The roots are " + "+" + g1 + " + " + "i" + "*" + Math.sqrt (g2) + " and " + g1 + " - " + "i" + "*" + Math.sqrt (g2));
}
}
}

```

OUTPUT:

```

C:\Users\bmsce\Desktop\1BM21CS022>javac quad.java
C:\Users\bmsce\Desktop\1BM21CS022>java quad
enter the values of a,b,c
0 2 3
the equation is not quadratic

C:\Users\bmsce\Desktop\1BM21CS022>java quad
enter the values of a,b,c
3 -18 27
the roots are real and equal
3.0

C:\Users\bmsce\Desktop\1BM21CS022>java quad
enter the values of a,b,c
1 -1 -6
the roots are real and distinct
3.0, -2.0

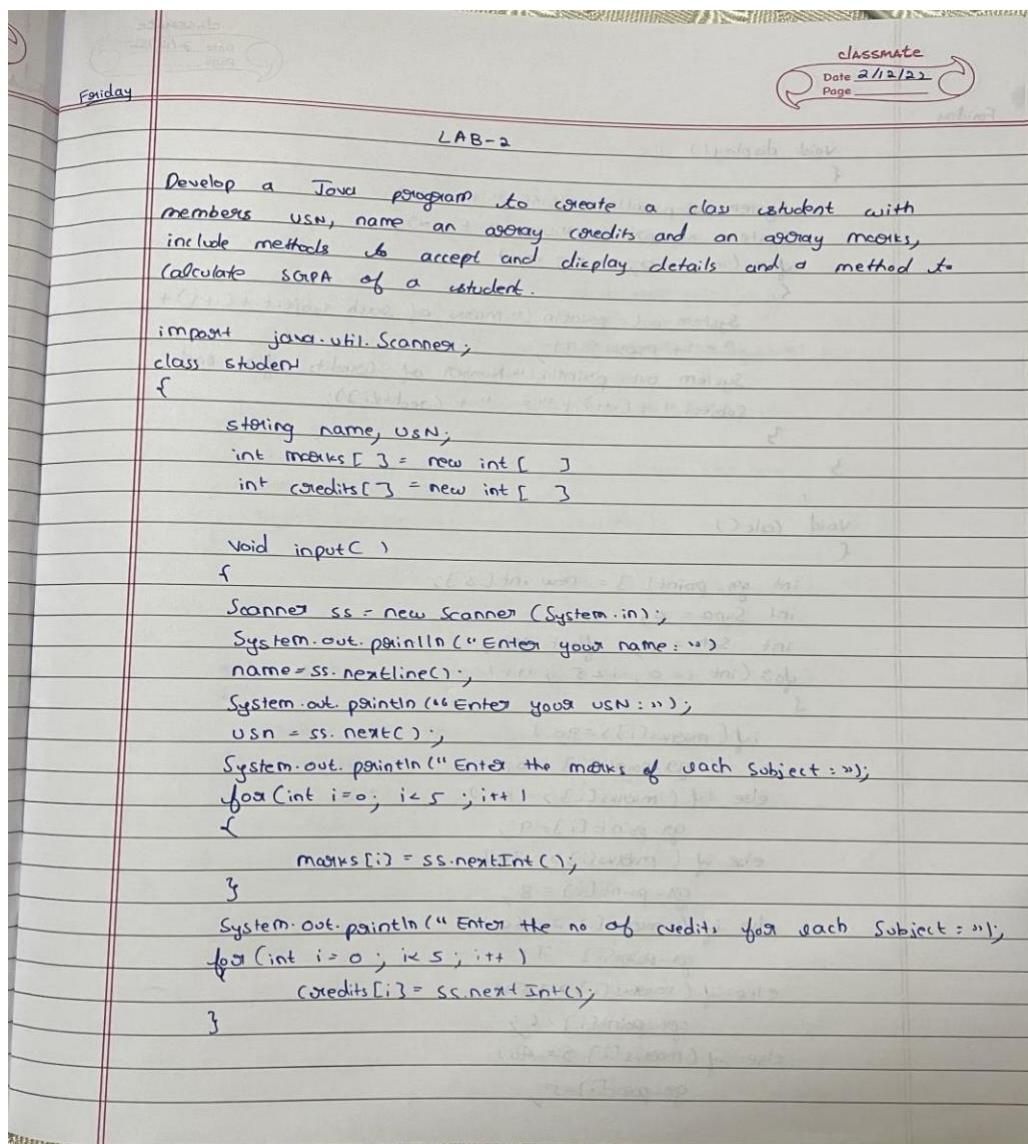
C:\Users\bmsce\Desktop\1BM21CS022>java quad
enter the values of a,b,c
1 -2 5
the roots are imaginary
the roots are 1.0+i*2.0 and 1.0-i*2.0

```

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.

CODE SNIPPET:



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```
Void display()
{
    System.out.println("NAME:" + name);
    System.out.println("USN:" + USN);
    for (int i = 0; i < 5; i++)
    {
        System.out.println("Marks of each subject (" + (i + 1) +
                           "): " + marks[i]);
    }
    System.out.println("Number of credits for each
Subject" + (i + 1) + "=" + credits[i]);
}

Void calc()
{
    int gpa_point[] = new int[5];
    int Sgpa = 0;
    int sum = 0;
    float avg;
    for (int i = 0; i < 5; i++)
    {
        if (marks[i] >= 90)
            gpa_point[i] = 10;
        else if (marks[i] >= 80)
            gpa_point[i] = 9;
        else if (marks[i] >= 70)
            gpa_point[i] = 8;
        else if (marks[i] >= 60)
            gpa_point[i] = 7;
        else if (marks[i] >= 50)
            gpa_point[i] = 6;
        else if (marks[i] >= 40)
            gpa_point[i] = 5;
    }
}
```

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```

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else if (marks[i] >= 35)
    gp = point[i];
else if (marks[i] < 35 & marks[i] > 0)
    gp = point[i];
else
    System.out.println ("Invalid marks");

for (int i = 0; i < 5; i++)
{
    sgpa += (gp * credits[i]);
    sum += credits[i];
}

res = (float) sgpa / sum;
System.out.println ("SGPA = " + res);

}

Class sgpa
{
    public static void main (String args[])
    {
        student s1 = new student();
        s1.input();
        s1.display();
        s1.cal();
    }
}

```

OUTPUT:

```

C:\Users\bmsce\Desktop>javac sgpa.java

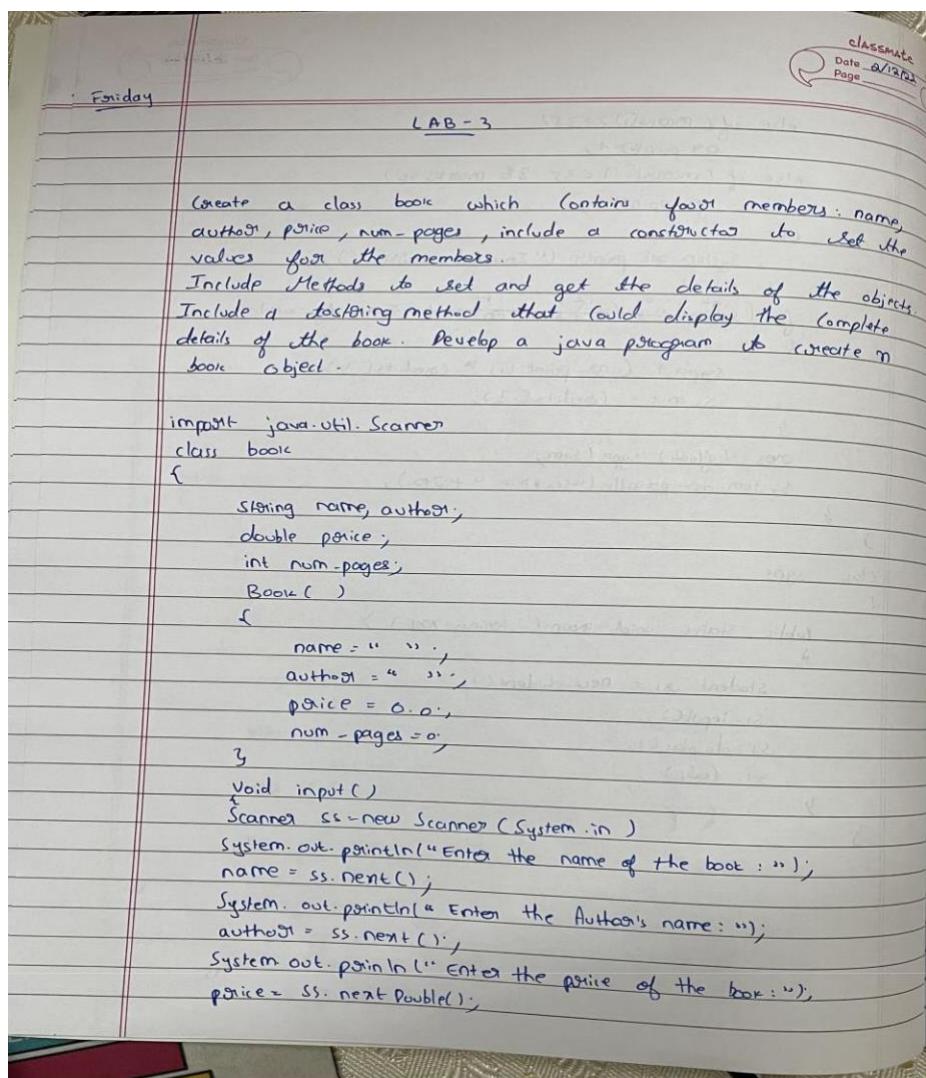
C:\Users\bmsce\Desktop>java sgpa
Enter your name :
anagha
Enter your usn:
1bm21cs022
enter the marks of each subject:
89
90
67
99
95
enetr the number of credits of each subject:
4
4
3
2
4
NAME :anagha
USN :1bm21cs022
Marks of each subject is89
number of credits for each subject1= 4
Marks of each subject is90
number of credits for each subject2= 4
Marks of each subject is67
number of credits for each subject3= 3
Marks of each subject is99
number of credits for each subject4= 2
Marks of each subject is95
number of credits for each subject5= 4
sgpa= 9.235294

```

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 SNIPPET :



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```

System.out.println("Enter the number of pages of the book:");
numPages = sc.nextInt();
}
public String toString()
{
    return ("Name: " + name + "\n AUTHOR : " + author +
    "\n PRICE : " + price + "\n /-\n Number of
    pages : " + numPages + "\n");
}
class book_main
{
    public static void main(String args)
    {
        Scanner ob = new Scanner(System.in);
        System.out.println("Enter the no of books : ");
        int n = ob.nextInt();
        Book book[] = new Book[n];
        for(int i=0; i<n; i++)
        {
            book[i] = new Book();
            book[i].input();
            System.out.println("\n Book Details ");
            System.out.println(book[i].toString());
        }
    }
}

```

OUTPUT:

```

C:\Users\Anagha\Desktop>java book_main
enter the no of books :
2
Enter the name of the book :
Beloved
enter the author's name :
Toni
enter the price of the book :
400
enter the no of pages of the book :
350

Book Details
Name :Beloved Author :Toni Price: 400.0 number of pages: 350
Enter the name of the book :
Atonement
enter the author's name :
Ian
enter the price of the book :
400
enter the no of pages of the book :
350

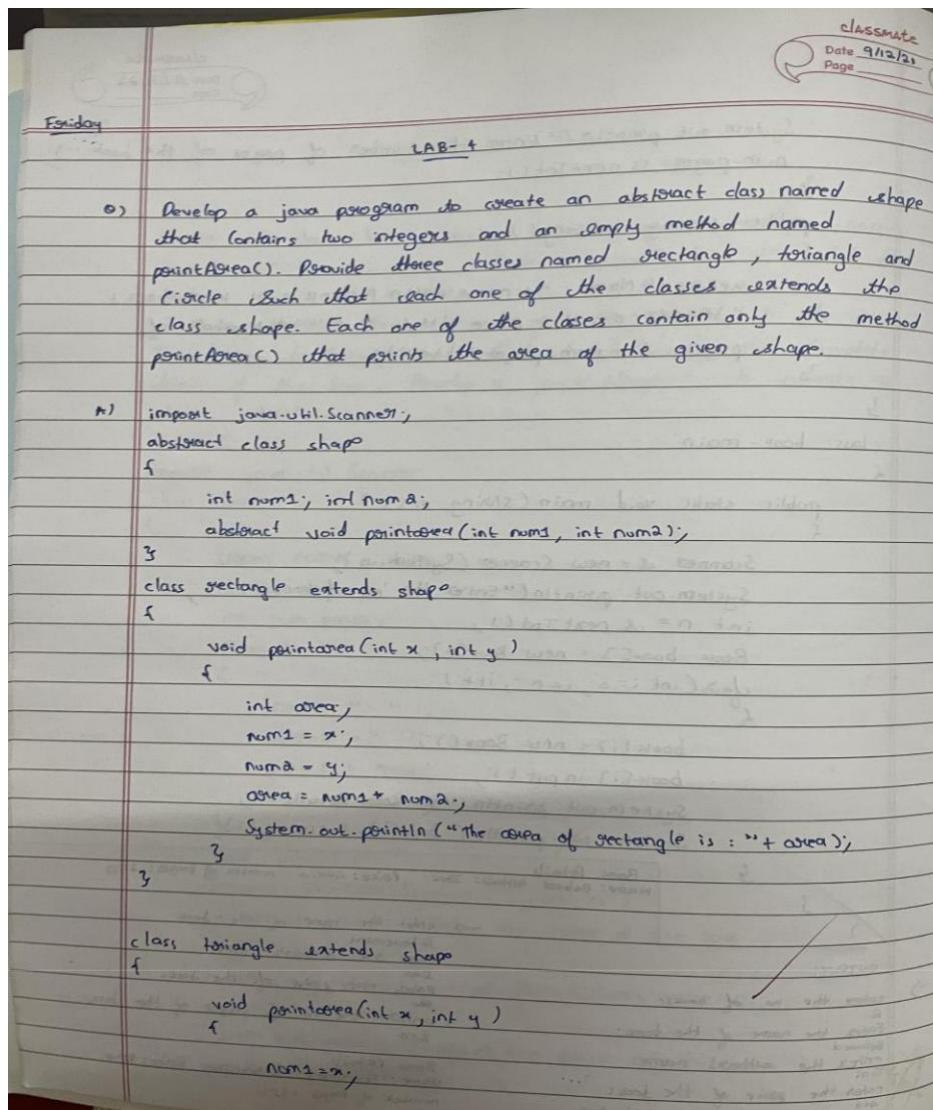
Book Details
Name :Atonement Author :Ian Price: 400.0 number of pages: 350

```

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.

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```

num1 = x;
double area;
area = (x * y) * num1 + num2;
System.out.println("The area of the triangle is: " + area);
}

class circle extends shape
{
    void printarea (int x, int y)
    {
        num1 = x;
        num2 = y;
        double area;
        area = (3.14) * num1 * num2;
        System.out.println("The area of the Circle is: " + area);
    }
}

class shape_main
{
    public static void main (String args[])
    {
        int a,b,pi;
        Scanner ss = new Scanner (System.in);
        rectangle r1 = new rectangle();
        triangle t1 = new triangle();
        circle c1 = new circle();
        System.out.println("Please enter the length & breadth of Rectangle");
        a = ss.nextInt();
        b = ss.nextInt();
        r1.printarea(a,b);
    }
}

```

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```

System.out.println ("Please enter base & height of triangle");
a = ss.nextInt();
b = ss.nextInt();
t1.printarea (a,b);
System.out.println ("Please enter radius of Circle");
r1 = ss.nextInt();
c1.printarea (r1,r1);
}

OUTPUT:
Please enter length and breadth of rectangle
5 10
The area of rectangle is: 50
Please enter base and height of triangle
3 6
The area of triangle is: 9.0
Please enter the radius of Circle
5
The area of the Circle is: 78.5
 $\pi r^2$ 

```

OUTPUT :

```
C:\Users\Anagha\Desktop\OOJ>java shape_main
please enter the length and breadth of rectangle
5 10
The area of the rectangle is : 50
please enter the base and height of triangle
6 3
the area of the triangle is : 9.0
please enter the radius of circle
5
the area of the circle is : 78.5
```

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:

- 1) Accept deposit from customer and update the balance.
- 2) Display the balance.
- 3) Compute and deposit interest
- 4) Permit withdrawal and update the balance
- 5) Check for the minimum balance, impose penalty if necessary and update the balance.

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```
import java.util.Scanner;
import java.lang.Math;
class Account
{
    String name, acc-type;
    int acc-no;
    double bal, dep;
    Scanner scan = new Scanner(System.in);
    void set()
    {
        System.out.println("Enter your name: ");
        name = scan.nextLine();
        System.out.println("Enter your Account Number: ");
        acc-no = scan.nextInt();
        System.out.println("Enter your Account type: (Savings/Current) ");
        acc-type = scan.next();
        System.out.println("Enter the Bank Balance: ");
        bal = scan.nextInt();
    }
    void disp()
    {
        System.out.println("Name : " + name);
        System.out.println("Account Number : " + acc-no);
        System.out.println("Account Type : " + acc-type);
        System.out.println("(Current balance is: " + bal);
    }
    void deposit()
    {
        System.out.println("Enter the Amount to be deposited: ");
        dep = scan.nextInt();
        bal += dep;
        System.out.println("BALANCE AMOUNT : " + bal);
    }
}
```

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```

class cur_acct extends Account
{
    int penal()
    {
        double min, pen;
        System.out.println("Enter minimum balance and penalty amount if
not followed : ");
        min = scan.nextDouble();
        pen = min * 0.05;
        if (bal < min)
            bal -= pen;
        System.out.println("penalty imposed for having insufficient balance");
        return 0;
    }
    else
        System.out.println("Insufficient balance");
    System.out.println("No penalty");
    return 1;
}

void withdrawal()
{
    double amt;
    System.out.println("Enter Amount to be withdrawn: ");
    amt = scan.nextInt();
    bal -= amt;
    if (bal <= 0)
        System.out.println("Insufficient balance");
    bal = bal - amt;
    System.out.println("Account Balance after withdrawal is: " + bal);
}

```

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else

{

System.out.println("The Amount can't be withdrawn");

{

}

class Sav-Acc extends Account

{

void calcInterest()

{

System.out.println("Enter time in years and Rate of interest");

double t = scan.nextDouble();

double r = scan.nextDouble();

double ct = bal * Math.pow((1 + r / 100), t);

System.out.println("Account balance and compounding interest is " + bal);

{

void withdrawal()

{

double amt;

System.out.println("Enter Amount to be withdrawn");

amt = scan.nextInt();

if (bal >= amt)

{

bal = bal - amt;

System.out.println("Account balance after withdrawal is " + bal);

{

else

{

System.out.println("The Amount can't be withdrawn");

{

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class Bank

{

public static void main(String args[])

{

Scanner ss = new Scanner(System.in);

Account b1 = new Account();

b1.setd();

if(b1.acc-type.equals("Savings"))

Sav-Acc s1 = new Sav-Acc();

s1.name = b1.name;

s1.acc-no = b1.acc-no;

s1.acc-type = b1.acc-type;

s1.bal = b1.bal;

while(true)

System.out.println("Enter your choice: 1. Deposit 2. calculate interest 3. Withdrawal 4. Display 5. Exit");

int choice = ss.nextInt();

switch(choice){

case 1: s1.deposit(); break;

case 2: s1.calc-interest(); break;

case 3: s1.withdrawal(); break;

case 4: s1.disp(); break;

case 5: System.exit(0); break;

default: System.out.println("Invalid input");

}

3

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else if (bl.acc-type.equals ("Current"))

{

 Cust-Acc c1 = new Cust-Acc();

 c1.name = bl.name;

 c1.acc-no = bl.acc-no;

 c1.acc-type = bl.acc-type;

 c1.bal = bl.bal;

 while (true)

{

 System.out.println ("Enter your choice: 1. Deposit \n 2.

 penalty check \n 3. withdrawal \n 4. Display \n 5. Exit");

 int choice = ss.nextInt();

 switch (choice)

{

 case 1: c1.deposit(); break;

 case 2: c1.penalty(); break;

 case 3: c1.withdrawal(); break;

 case 4: c1.display(); break;

 case 5: System.exit(0); break;

 default: System.out.println ("Invalid input");

}

}

else

{

 System.out.println ("Invalid Account type");

}

OUTPUT:

```
Enter your Name:  
Dhiksha  
Enter your Account Number:  
123456  
Enter your Account type: (Savings/Current)  
Savings  
Enter the Bank Balance:  
30000  
Enter your choice:  
1.Deposit  
2.Calculate interest  
3.Withdraw  
4.Display  
5.Exit  
1  
Enter the amount to be deposited:  
5000  
Balance Amount: 35000.0  
Enter your choice:  
1.Deposit  
2.Calculate interest  
3.Withdraw  
4.Display  
5.Exit  
3  
Enter amount to be withdrawn:  
5000  
Account Balance after withdrawal is:30000.0  
Enter your choice:  
1.Deposit  
2.Calculate interest  
3.Withdraw  
4.Display  
5.Exit  
2  
Enter Time in years and Rate of interest  
2 5.4
```

cmd Command Prompt

```
Enter your choice:  
1.Deposit  
2.Calculate interest  
3.Withdraw  
4.Display  
5.Exit  
2  
Enter Time in years and Rate of interest  
2 5.4  
Account Balance after compounding interest: 33327.48  
Enter your choice:  
1.Deposit  
2.Calculate interest  
3.Withdraw  
4.Display  
5.Exit  
4  
Name: Dhiksha  
Account Number: 123456  
Account Type: Savings  
Current balance is: 33327.48  
Enter your choice:  
1.Deposit  
2.Calculate interest  
3.Withdraw  
4.Display  
5.Exit  
5
```

```
C:\Users\Anagha\Desktop\OOJ\Lab6>java Bank
Enter your Name:
Anagha
Enter your Account Number:
135672
Enter your Account type: (Savings/Current)
Current
Enter the Bank Balance:
50000
Enter your choice:
1.Deposit
2.Penalty Check
3.Withdraw
4.Display
5.Exit
1
Enter the amount to be deposited:
300
BALANCE AMOUNT: 50300.0
Enter your choice:
1.Deposit
2.Penalty Check
3.Withdraw
4.Display
5.Exit
2
Enter Minimum balance & penalty amount if not followed:
No penalty
Enter your choice:
1.Deposit
2.Penalty Check
3.Withdraw
4.Display
5.Exit
```

Lab Program 6 :

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 Snippet :

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Lab - 6

- (a) 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 takes both father and son's age and throws an exception if Son's age is \geq father's age.

```
import java.util.Scanner  
class WrongAge extends Exception  
{  
    WrongAge() { }  
    String msg = new String();  
    WrongAge (String s)  
    { msg = s; }  
    public String toString()  
    { return msg; }  
  
}  
class ErrorAge extends WrongAge  
{  
    String msg1 = new String();  
    ErrorAge (String ss)  
    { msg1 = ss; }  
    public String toString()  
    { return msg1; }  
}
```

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```
class Father  
{  
    int age;  
    Scanner in = new Scanner (System.in);  
    Father()  
    {  
        System.out.print ("Enter the father's age: ");  
        age = in.nextInt();  
    }  
    void err() throws WrongAge  
    {  
        if (age <= 0)  
            throw new WrongAge ("Invalid input. Father's Age cannot be less than 0");  
    }  
}
```

```
class Son extends Father  
{  
    int age;  
    Son()  
    {  
        System.out.println ("Enter the age of son: ");  
        age = in.nextInt();  
    }  
    void err() throws ErrorAge  
    {  
        if (age >= 0 & age > super.age)  
            throw new ErrorAge ("Age of father less than son");  
        else System.out.print ("FATHER'S AGE: " + super.age + " IN SON'S AGE: " +  
    }  
}
```

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```

class A_main
{
    public static void main( String[] args )
    {
        Son s = new Son();
        try
        {
            s.exec();
        }
        catch ( WrongAge e )
        {
            System.out.println(e);
        }
        try
        {
            s.exec();
        }
        catch ( ExtraAge e )
        {
            System.out.println(e);
        }
    }
}

```

Output :

```

C:\Users\Anagha\Desktop\OOJ\Lab6>javac A_main.java
C:\Users\Anagha\Desktop\OOJ\Lab6>java A_main
Enter the father's age:
50
Enter the age of son:
17
FATHER'S AGE:50
SON'S AGE:17

C:\Users\Anagha\Desktop\OOJ\Lab6>java A_main
Enter the father's age:
23
Enter the age of son:
45
age of father less than son

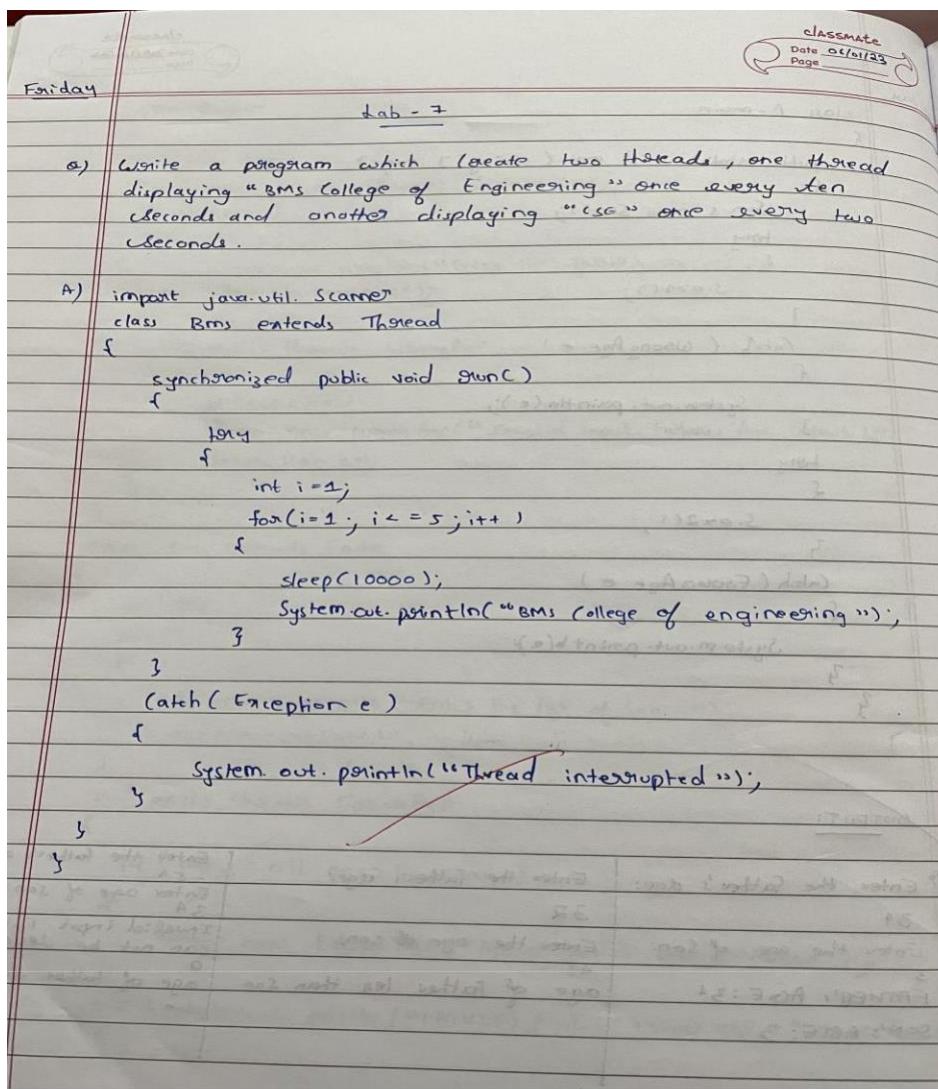
C:\Users\Anagha\Desktop\OOJ\Lab6>java A_main
Enter the father's age:
-1
Enter the age of son:
3
Invalid input. Father's age can not be lesser than 0
age of father less than son

```

Lab Program 7 :

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 Snippet :



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```

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class CSE extends Thread
{
    synchronized public void run()
    {
        for
        {
            int i=1;
            for (i=1; i<=10; i++)
            {
                sleep(2000);
                System.out.println("CSE");
            }
        }
        catch (Exception e)
        {
            System.out.println("Thread interrupted");
        }
    }
}

class Main
{
    public static void main (String args[])
    {
        BMS b1 = new BMS();
        CSE c1 = new CSE();
        b1.start();
        c1.start();
    }
}

```

Output :

```

C:\Users\Anagha\Desktop\OOP\lab 7>javac Main.java
C:\Users\Anagha\Desktop\OOP\lab 7>java Main
CSE
CSE
CSE
CSE
BMS college of engineering
CSE
CSE
CSE
CSE
CSE
BMS college of engineering
CSE
BMS college of engineering
BMS college of engineering
BMS college of engineering

```

Lab Program 8 :

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 SNIPPET :

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Q) 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.

Student.java :

```
package CIE;
import java.util.*;
public class Student {
    String usn;
    String name;
    int sem;
    public void setinfo() {
        System.out.println("Enter usn, name, sem:");
        Scanner ss = new Scanner(System.in);
        usn = ss.nextLine();
        name = ss.nextLine();
        sem = ss.nextInt();
    }
}
```

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```
public void display()
{
    System.out.println("USN : " + usn);
    System.out.println("NAME : " + name);
    System.out.println("SEM : " + sem);
}
```

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Internals.java :

```
package CIE;
import java.util.*;
public class Internals extends Student
{
    public double arrcie[] = new double[5];
    public void setd()
    {
        System.out.println("Enter marks for 5 Subjects");
        Scanner ss = new Scanner(System.in);
        for(int i=0; i<5; i++)
        {
            arrcie[i] = ss.nextDouble();
        }
    }
    public void disp()
    {
        System.out.println("CIE marks of 5 sub are : ");
        for(int i=0; i<5; i++)
        {
            System.out.println(arrcie[i]);
        }
    }
}
```

3



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External.java

```

package SEE;
import CIE.internals;
import java.util.*;

public class External extends internals
{
    public double arrsee[] = new double[5];
    double finalm[] = new double[5];
    public void set()
    {
        System.out.println("Enter marks of 5 Subjects of SEE :");
        Scanner ss = new Scanner(System.in);
        for(int i=0; i<5; i++)
        {
            arrsee[i] = ss.nextDouble();
        }
    }

    public void disp2()
    {
        System.out.println("SEE MARKS of 5 SUB ARE :");
        for(int i=0; i<5; i++)
        {
            System.out.println(arrsee[i]);
        }
    }

    public void finalmarks()
    {
        for(int i=0; i<5; i++)
        {
            finalm[i] = arrsee[i] + weight[i];
        }
    }
}

```

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```

public void dispf()
{
    System.out.println("FINAL MATRIX IS : ");
    for(int i=0; i<5; i++)
    {
        System.out.println(finalm[i]);
    }
}

```

Main.java

```

import CSE.Student;
import CSE.internals;
import CSE.external;
import java.util.*;
class Main
{
    public static void main(String args)
    {
        System.out.println("Enter no of students:");
        Scanner ss = new Scanner(System.in);
        int n;
        double fin[] = new double[5];
        n=ss.nextInt();
        external e1[] = new external[n];
        for(int i=0; i<n; i++)
        {
            e1[i] = new external();
            e1[i].setinfo();
            e1[i].setd();
        }
    }
}

```

classmate
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```

e1[i].set();
e1[i].finalmark();
e1[i].dispf();
}
}

```

OUTPUT:

```
C:\Users\Anagha\Desktop\1BM21CS022>java Main
Enter no of students :
2
Enter usn,name,sem:
1BM21CS022 Anagha 3
Enter marks for 5 subjects :
45
48
49
43
47
Enter marks for 5 subjects for SEE  :
49
49
48
45
46
FINAL MARKS IS :
94.0
97.0
97.0
88.0
93.0
```

```
Enter usn,name,sem:
1BM21CS001 Sneha 3
Enter marks for 5 subjects :
45
48
42
49
47
Enter marks for 5 subjects for SEE  :
43
45
46
47
48
FINAL MARKS IS :
88.0
93.0
88.0
96.0
95.0
```