B.M.S. College of Engineering

(Autonomous College Affiliated to Visvesvaraya Technological University, Belgaum)

Bull Temple Road, Basavanagudi, Bengaluru – 560019

Department of

Computer Science & Engineering (CSE)

Lab Report on OOJ

Course Title:

Object Oriented Java Programming

Course Code: 23CS3PCOOJ

By

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This is to certify that the Lab work entitled **"OBJECT ORIENTED JAVA PROGRAMMING"** carried out by **TANYA D SHETTY (1BM22CS337),** who is bonafide student of **B. M. S. College of Engineering**. It is in partial fulfillment for the award of Bachelor of Engineering in Computer Science and Engineering of the Visvesvaraya Technological University, Belgaum during the year 2023- 24. The Lab report has been approved as it satisfies the academic requirements in respect of **OOJ Lab - (23CS3PCOOJ)** work prescribed for the said degree.

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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.*;
import java.lang.Math;
class Quadratic{
float a,b,c,d,r1,r2;
void getd(){
Scanner in=new Scanner(System.in);
System.out.println("Enter value of a:");
a=in.nextFloat();
System.out.println("Enter value of b:");
b=in.nextFloat();
System.out.println("Enter value of c:");
c=in.nextFloat();
}
void display(){
d=(b*b)-(4*a*c);
if(d==0.0){
System.out.println("The roots are real and equal.");
r1=(float)(-b+Math.sqrt(d))/(2*a);
System.out.println("The roots are :"+r1+" and "+r1);
}
else if(d>0.0){
r1=(float)(-b+Math.sqrt(d))/(2*a);
r2=(float)(-b-Math.sqrt(d))/(2*a);
System.out.println("The roots are real and unequal.");
System.out.println("The roots are :"+r1+" and "+r2);
}
else{
System.out.println("There are no real roots");}
}
```

```
}
class Quadraticequation
{
public static void main(String args[])
{
System.out.println("Tanya D Shetty");
System.out.println("1BM22CS337");
Quadratic q=new Quadratic();
q.getd();
q.display();
}}
```

OUTPUT:

```
D:\java\ABC>java Quadraticequation
Tanya D Shetty
1BM22CS337
Enter value of a:
1
Enter value of b:
2
Enter value of c:
1
The roots are real and equal.
The roots are :-1.0 and -1.0

D:\java\ABC>java Quadraticequation
Tanya D Shetty
1BM22CS337
Enter value of a:
1.0
Enter value of b:
3.4
Enter value of c:
5.9
There are no real roots

D:\java\ABC>java Quadraticequation
Tanya D Shetty
1BM22CS337
Enter value of a:
1
Enter value of b:
6
Enter value of c:
3

The roots are real and unequal.
The roots are :-0.5505102 and -5.4494896
```

LAB PROGRAM-2

Write a Java program to create a class Student with members USN, name, marks(6 subjects). Include methods to accept student details and marks, Also include a method to calculate the percentage and display appropriate details. (Array of student object to be created)

CODE:

```
import java.util.*;
class Student{
int usn;
String name=new String();
double marks[]=new double[6];
double ind_tot=0.0,percentage;

void getd(){
Scanner in=new Scanner(System.in);
System.out.println("Enter USN:");
usn=in.nextInt();
System.out.println("Enter name:");
name=in.next();
System.out.println("Enter subject marks(out of 100):");
for(int i=0;i<=5;i++){
System.out.println("Enter marks of subject "+(i+1)+":");
marks[i]=in.nextDouble();
}
}

double percen(){
double total=600.0;
for(int i=0;i<6;i++){
ind_tot=ind_tot+marks[i];
}
return ((ind_tot/total)*100);
}

void display(){
```

```
System.out.println("usn:"+usn);
System.out.println("name:"+name);
}
}

class Student_info
{
public static void main(String args[])
{
int n;
System.out.println("Tanya D Shetty");
System.out.println("1BM22CS337");
Scanner input=new Scanner(System.in);
System.out.println("Enter number of students");
n=input.nextInt();
Student s[]=new Student[n];

for(int i=0;i<n;i++){
s[i]=new Student();
s[i].getd();
}

for(int i=0;i<n;i++){
System.out.println("details of student "+(i+1)+" are :");
s[i].display();
double c=s[i].percen();
System.out.println("Total percentage in all subjects:"+c);
}}}
```

OUTPUT:

```
D:\java\ABC>javac Student_info.java

D:\java\ABC>java Student_info
Tanya D Shetty
1BM22CS337
Enter number of students
2
Enter USN:
111
Enter name:
tanya
Enter subject marks(out of 100):
Enter marks of subject 1:
90
Enter marks of subject 2:
99
Enter marks of subject 3:
90
Enter marks of subject 4:
89
Enter marks of subject 5:
97
Enter marks of subject 6:
97.6
Enter USN:
222
Enter name:
Ahana
Enter subject marks(out of 100):
Enter marks of subject 1:
78
Enter marks of subject 2:
90
Enter marks of subject 3:
100
Enter marks of subject 4:
69
Enter marks of subject 5:
80
Enter marks of subject 6:
79
details of student 1 are :
usn:111
name:tanya
Total percentage in all subjects:93.76666666666668
details of student 2 are :
usn:222
name:Ahana
Total percentage in all subjects:82.66666666666667
```

LAB PROGRAM-3:

Create a class Book that contains four members: name, author, price, and 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.*;
class Books{
int num_pages;
String name=new String();
String author=new String();
float price;
Books(){}
Books(String name,String author,float price,int num_pages){
this.name=name;
this.author=author;
this.price=price;
this.num_pages=num_pages;
}
public String toString(){
String a,b,c,d;
a = "Book name: " + this.name + "\n";

b="Book author: "+ this.author + "\n";
c="Book price:"+this.price+"\n";
d="Number of pages:"+this.num_pages+ "\n";
return a+b+c+d;
}
}
class Books_info_1{
public static void main(String args[])
{

int n,num_pages;
```

```
String name=new String();
String author=new String();
float price;
System.out.println("Tanya D Shetty");
System.out.println("1BM22CS337");
Scanner in=new Scanner(System.in);
System.out.println("Enter number of Books");
n=in.nextInt();
Books b[]=new Books[n];

for(int i=0;i<n;i++){
System.out.println("enter details of book "+(i+1)+":");
System.out.println("Enter book title:");
name=in.next();
System.out.println("Enter book author");
author=in.next();
System.out.println("Enter book price:");
price=in.nextFloat();
System.out.println("Enter book pages:");
num_pages=in.nextInt();
b[i]=new Books(name,author,price,num_pages);
}
for(int i=0;i<n;i++){
System.out.println("details of book "+(i+1)+ "\n" +b[i]);
}}}
```

OUTPUT:

```
D:\java\ABC>javac Books_info_1.java

D:\java\ABC>java Books_info_1
Tanya D Shetty
1BM22CS337
Enter number of Books
1
enter details of book 1:
Enter book title:
Matilda
Enter book author
Roald
Enter book price:
399.99
Enter book pages:
450
details of book 1
Book name: Matilda
Book author: Roald
Book price:399.99
Number of pages:450
```

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 the method printArea( ) that prints the area of the given shape.

CODE:

```
import java.util.*;
abstract class Shape{
int a,b;
abstract void printArea( );
}
class Rectangle extends Shape{
void printArea(){
System.out.println("area of rectangle:"+(a*b)+"\n");}}

class Triangle extends Shape{
void printArea(){
System.out.println("area of triangle:"+(0.5*a*b)+"\n");}}

class Circle extends Shape{
void printArea(){
System.out.println("area of rectangle:"+(3.142*a*a)+"\n");}}

class Abstract
{
public static void main(String args[])
{
System.out.println("Tanya D Shetty");
System.out.println("1BM22CS337");
Scanner in=new Scanner(System.in);
Rectangle r=new Rectangle();
Triangle t=new Triangle();
Circle c=new Circle();
System.out.println("Enter length and breadth of rectangle:");
```

```
r.a=in.nextInt();
r.b=in.nextInt();
r.printArea();

System.out.println("Enter height and base of triangle:");
t.a=in.nextInt();
t.b=in.nextInt();
t.printArea();

System.out.println("Enter radius of circle:");
c.a=in.nextInt();
c.printArea();
}
}
```

OUTPUT:

```
D:\java\ABC>javac Abstract.java

D:\java\ABC>java Abstract
Tanya D Shetty
1BM22CS337
Enter length and breadth of rectangle:
2
5
area of rectangle:10

Enter height and base of triangle:
3
5
area of triangle:7.5

Enter radius of circle:
4
area of rectangle:50.272
```

LAB PROGRAM 5:

1. 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
{
public static  int min=500;
String name;
int Account_num;
public float o_Price;
Scanner sc=new Scanner(System.in);
public void get_info()
{
System.out.println("Enter Name:");
name=sc.nextLine();
System.out.println("Enter Account Number:");
Account_num=sc.nextInt();
System.out.println("Enter opening Ammount ,must be >500:");
o_Price=sc.nextFloat();
if(o_Price <500)
{
System.out.println("Enter opening Ammount,must be >500:");
} }
```

```
public void show()
{
System.out.println("Name:"+name);
System.out.println("Account_number:"+Account_num);
System.out.println("Ammount:"+o_Price);
}
}
class  Current  extends Account
{
float deposit,withdraw,penality;
public void deposit()
{
System.out.println("Eneter Ammount to deposit") ;
deposit =sc.nextFloat();
show();
o_Price=o_Price+deposit;
System.out.println("Total Ammount is :"+o_Price) ; }
public void check_Bal()
{
if(o_Price<min)
{
System.out.println("Ammont Should be >500");
o_Price=o_Price-150;
System.out.println("You have debited ammount 150 from your acccount Account balance
is:"+o_Price);
}

}
public void withdraw_Bal()
{
System.out.println("Enter Ammount to withdraw");
withdraw=sc.nextFloat();
show();
if(withdraw<o_Price)
```

```
{
o_Price=o_Price-withdraw;
System.out.println("After Withdawl Balance "+o_Price);
}
else
{
System.out.println("Insufficent Balance cant not be less than 500");
}
check_Bal();

}
}
class Saving extends Account
{

float deposit,withdraw,intr;
public void deposit()
{
System.out.println("Enter Ammount to deposit") ;
deposit =sc.nextFloat();
show();
o_Price=o_Price+deposit;
System.out.println("Total Ammount is :"+o_Price) ;

}
public void check_intrest()
{

intr=(o_Price*2)/100;
o_Price=o_Price+intr;
System.out.println("Total Ammount with interest is :"+o_Price) ;
}
public void withdraw_Bal()
{
```

```
System.out.println("Enter Ammount to withdraw:");
withdraw=sc.nextFloat();
show();
if(withdraw<o_Price)
{
o_Price=o_Price-withdraw;
System.out.println("After Withdawl Balance: "+o_Price);
}
else
{
System.out.println("Insufficent Balance!");
}
}
}

public class Account2
{
static String ch;
public static void main(String[] args)
{
int count=0;
Scanner sc=new Scanner(System.in);
Current  cu=new Current ();
Saving  sav=new Saving ();
System.out.println("Tanya D Shetty");
System.out.println("1BM22CS337");
System.out.println("Choose Account type:");
System.out.println("Press c  for Current Account:");
System.out.println("Press s  for Saving Account:");
ch=sc.nextLine();
if(ch.equalsIgnoreCase("c"))
{
cu.get_info();
cu.check_Bal();
```

```
while(count!=4)
{

System.out.println("1.Display\n2.Deposit\n3.Withdraw\n4.Exit");
System.out.println("Enter Your Choice");
int cho=sc.nextInt();
switch(cho)
{
case 1: cu.show();
break;
case 2: cu.deposit();
break;
case 3: cu.withdraw_Bal();
break;
case 4: System.exit(0);
break;
default:System.out.println("Wrong Choice!");
}
}
}
else if(ch.equalsIgnoreCase("s"))
{
sav.get_info();

while(count!=5)
{
System.out.println("1.Display\n2.Deposit\n3.Withdraw\n4Intrest\n5.Exit");
System.out.println("Enter Your Choice");
int cho=sc.nextInt();
switch(cho)
{
case 1: sav.show();
break;
case 2: sav.deposit();
```

```
break;
case 3: sav.withdraw_Bal();
break;
case 4: sav.check_intrest();
break;
case 5: System.exit(0);
break;
default:System.out.println("Wrong Choice!");
}
}
}
else
{
System.out.println("Wrong choice!");
}
}
}
```

OUTPUT:

(FOR CURRENT ACCOUNT)

```
D:\java>javac Account2.java

D:\java>java Account2
Tanya D Shetty
1BM22CS337
Choose Account type:
Press c  for Current Account:
Press s  for Saving Account:
C
Enter Name:
tanya
Enter Account Number:
22423
Enter opening Ammount ,must be >500:
800
1.Display
2.Deposit
3.Withdraw
4.Exit
Enter Your Choice
3
Enter Ammount to withdraw
700
Name:tanya
Account_number:22423
Ammount:800.0
After Withdawl Balance 100.0
Ammont Should be >500
You have debited ammount 150 from your acccount Account balance is:-50.0
1.Display
2.Deposit
3.Withdraw
4.Exit
Enter Your Choice
3
Enter Ammount to withdraw
700
Name:tanya
Account_number:22423
Ammount:800.0
After Withdawl Balance 100.0
Ammont Should be >500
You have debited ammount 150 from your acccount Account balance is:-50.0
1.Display
2.Deposit
3.Withdraw
4.Exit
Enter Your Choice
2
Eneter Ammount to deposit
10000
Name:tanya
Account_number:22423
Ammount:-50.0
Total Ammount is :9950.0
1.Display
2.Deposit
3.Withdraw
4.Exit
Enter Your Choice
4
```

(FOR SAVINGS ACCOUNT)

```
D:\java>java Account2
Tanya D Shetty
1BM22CS337
Choose Account type:
Press c  for Current Account:
Press s  for Saving Account:
S
Enter Name:
TANYA
Enter Account Number:
2343322
Enter opening Ammount ,must be >500:
4555
1.Display
2.Deposit
3.Withdraw
4Intrest
5.Exit
Enter Your Choice
4
Total Ammount with interest is :4646.1
1.Display
2.Deposit
3.Withdraw
4Intrest
5.Exit
Enter Your Choice
3
Enter Ammount to withdraw:
4556
Name:TANYA
Account_number:2343322
Ammount:4646.1
After Withdawl Balance: 90.1001
1.Display
2.Deposit
3.Withdraw
4Intrest
5.Exit
Enter Your Choice
4
Total Ammount with interest is :91.9021
1.Display
2.Deposit
3.Withdraw
4Intrest
5.Exit
Enter Your Choice
```

LAB PROGRAM 6:

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

1. Create a folder CIE and save the programs Student.java and Internals.java within it.

2. Create a folder SEE and save the program External.java within it.

3. Save the Main program outside these two folders.

4. Compile Main.java and Execute the Main.class

CODE:

Student.java

```
package CIE;
public class Student {
public String usn,name;
public int sem;
public Student(String usn, String name, int sem) {
this.usn=usn;
this.name=name;
this.sem=sem;
}
}
```

Internals.java

```
package CIE;
public class Internals extends Student {
public int[] internalMarks;
public Internals(String usn, String name, int sem, int[] internalMarks) {
super(usn, name, sem);
this.internalMarks = internalMarks;
}
}
```

External.java

```
package SEE;
```

```
import CIE.Student;
public class External extends Student {
public int[] seeMarks;
public External(String usn, String name, int sem, int[] seeMarks) {
super(usn, name, sem);
this.seeMarks = seeMarks;
}
}
```

FinalMarks.java

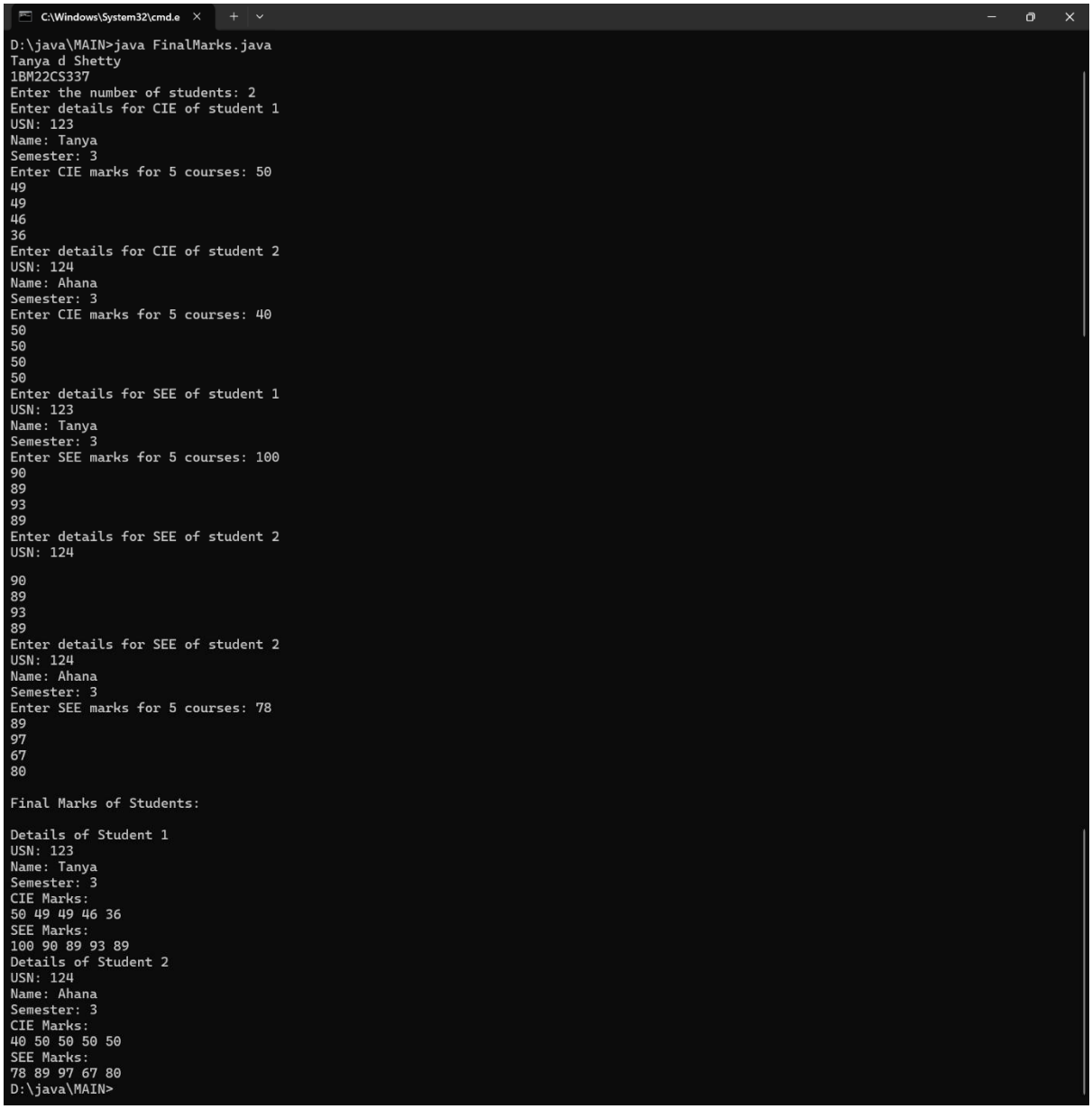
```
import CIE.Internals;
import SEE.External;
import java.util.Scanner;
public class FinalMarks {
public static void main(String[] args) {
Scanner scanner = new Scanner(System.in);
System.out.print("Enter the number of students: ");
int n = scanner.nextInt();
Internals[] cieStudents = new Internals[n];
External[] seeStudents = new External[n];
// Input CIE marks
for (int i = 0; i < n; i++) {
System.out.println("Enter details for CIE of student " + (i + 1));
System.out.print("USN: ");
String usn = scanner.next();
System.out.print("Name: ");
String name = scanner.next();
System.out.print("Semester: ");
int sem = scanner.nextInt();
int[] cieMarks = new int[5];
System.out.print("Enter CIE marks for 5 courses: ");
for (int j = 0; j < 5; j++) {
cieMarks[j] = scanner.nextInt();
}
```

```
cieStudents[i] = new Internals(usn, name, sem, cieMarks);
}

// Input SEE marks
for (int i = 0; i < n; i++) {
System.out.println("Enter details for SEE of student " + (i + 1));
System.out.print("USN: ");
String usn = scanner.next();
System.out.print("Name: ");
String name = scanner.next();
System.out.print("Semester: ");
int sem = scanner.nextInt();
int[] seeMarks = new int[5];
System.out.print("Enter SEE marks for 5 courses: ");
for (int j = 0; j < 5; j++) {
seeMarks[j] = scanner.nextInt();
}
seeStudents[i] = new External(usn, name, sem, seeMarks);
}
// Displaying final marks
System.out.println("\nFinal Marks of Students:");
for (int i = 0; i < n; i++) {
System.out.println("\nDetails of Student " + (i + 1));
System.out.println("USN: " + cieStudents[i].usn);
System.out.println("Name: " + cieStudents[i].name);
System.out.println("Semester: " + cieStudents[i].sem);
System.out.println("CIE Marks: ");
for (int j = 0; j < 5; j++) {
System.out.print(cieStudents[i].internalMarks[j] + " ");
}
System.out.println("\nSEE Marks: ");
for (int j = 0; j < 5; j++) {
System.out.print(seeStudents[i].seeMarks[j] + " ");
}
```

```
}
}
}
```

OUTPUT:


C:\Windows\System32\cmd.e
D:\java\MAIN>java FinalMarks.java
Tanya d Shetty
1BM22CS337
Enter the number of students: 2
Enter details for CIE of student 1
USN: 123
Name: Tanya
Semester: 3
Enter CIE marks for 5 courses: 50
49
49
46
36
Enter details for CIE of student 2
USN: 124
Name: Ahana
Semester: 3
Enter CIE marks for 5 courses: 40
50
50
50
50
Enter details for SEE of student 1
USN: 123
Name: Tanya
Semester: 3
Enter SEE marks for 5 courses: 100
90
89
93
89
Enter details for SEE of student 2
USN: 124
90
89
93
89
Enter details for SEE of student 2
USN: 124
Name: Ahana
Semester: 3
Enter SEE marks for 5 courses: 78
89
97
67
80
Final Marks of Students:
Details of Student 1
USN: 123
Name: Tanya
Semester: 3
CIE Marks:
50 49 49 46 36
SEE Marks:
100 90 89 93 89
Details of Student 2
USN: 124
Name: Ahana
Semester: 3
CIE Marks:
40 50 50 50 50
SEE Marks:
78 89 97 67 80
D:\java\MAIN>

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.*;
class WrongAge extends Exception{
public WrongAge(String str){
super(str);}
}
class father{
int f_age;
father(int age) throws WrongAge{
f_age=age;
if(age<=0){
throw new WrongAge("age must be above 0");
}}}
class son extends father{
int s_age;
son(int age,int fage) throws WrongAge{
super(fage);
s_age=age;
if(s_age>=fage){
throw new WrongAge("age must be lesser than fathers age");
}
}
}
class father_son_exception{
public static void main(String args[]){
System.out.println("Tanya D Shetty");
System.out.println("1BM22CS337");
int f_age,s_age;
Scanner in=new Scanner(System.in);
```

```
System.out.println("enter father's age");
f_age=in.nextInt();
try{
father f=new father(f_age);
}
catch(WrongAge e){System.out.println("Exception:age must be above 0");}
System.out.println("enter son's age");
s_age=in.nextInt();
try{
son s=new son(s_age,f_age);
}catch(WrongAge e){System.out.println("Exception:"+e.getMessage());}
}
}
```

OUTPUT:

```
D:\java>javac father_son_exception.java

D:\java>java father_son_exception
Tanya D Shetty
1BM22CS337
enter father's age
-2
Exception:age must be above 0
enter son's age
3
Exception:age must be above 0

D:\java>java father_son_exception
Tanya D Shetty
1BM22CS337
enter father's age
100
enter son's age
89

D:\java>java father_son_exception
Tanya D Shetty
1BM22CS337
enter father's age
78
enter son's age
99
Exception:age must be lesser than fathers age
```

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 bms extends Thread{
public void run(){
try{
for(int i=0;i<10;i++){
System.out.println("BMS COLLEGE OF ENGINEERING");
Thread.sleep(10000);
}
}
catch(InterruptedException e)
{
System.out.println("Exception handled");
}
}
}
class cse extends Thread{
public void run(){
try{
for(int i=0;i<10;i++){
System.out.println("CSE");
Thread.sleep(2000);
}
}
catch(InterruptedException e){
System.out.println("ENDED");}
{
System.out.println("Exception handled");
}
}
}
class Thread_college{
```

```
public static void main(String args[]){
System.out.println("TANYA D SHETTY");
System.out.println("1BM22CS337");
bms b=new bms();
cse c=new cse();
c.start();
b.start();
try{
b.join();
c.join();}
catch(InterruptedException e)
{
System.out.println("Exception handled");
}
{
System.out.println("ENDED");
}
}
}
```

OUTPUT: