

VISVESVARAYA TECHNOLOGICAL UNIVERSITY

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LAB REPORT

on

Object Oriented Java Programming (22CS3PCOOJ)

Submitted by

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in partial fulfillment for the award of the degree of
BACHELOR OF ENGINEERING
in
COMPUTER SCIENCE AND ENGINEERING



B.M.S. COLLEGE OF ENGINEERING

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CERTIFICATE

This is to certify that the Lab work entitled “Object Oriented Java Programming” (22CS3PCOOJ) carried out by **ANSHU MOHANDAS (1BM21CS025)**, 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 2022. The Lab report has been approved as it satisfies the academic requirements in respect of a Object Oriented Java Programming (22CS3PCOOJ) work prescribed for the said degree.

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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 discriminant $b^2 - 4ac$ is negative, display a message stating that there are no real solutions.

```
→ import java.util.Scanner;  
class deploy {  
    public static void main(String xx[]) {  
        int a,b,c;  
        Scanner s = new Scanner(System.in);  
        System.out.println("Enter the coefficients a,b,c(m");  
        a = s.nextInt();  
        b = s.nextInt();  
        c = s.nextInt();  
        double des = (b*b) - (4*a*c);  
        double root1,root2;  
        if(a==0) {System.out.println("The equation is not  
quadratic(m");}  
else if (des>0) {  
    root1 = -b + Math.sqrt(des);  
    root2 = -b - Math.sqrt(des);
```

```

    System.out.println ("The roots are real and
    distinct\nRoot 1: "+root1+" \nRoot 2: "+root2);
}
else if (des==0) {
    root1 = root2 = -b/(k+a);
    System.out.println ("The roots are real and equal\nRoot1:
    "+root1+" \nRoot2: "+root2);
}
else {
    root1 = -b/(k+a);
    root2 = Math.sqrt(Math.abs(des));
    System.out.println ("The roots are imaginary\nRoot1: "+root1+" + i*"+root2+
    "\nRoot2: "+root1+" - i*"+root2);
}
}
}
}
}

```

```
C:\Users\anshu\Desktop\1BM21CS025>java deploy
Enter the coefficients a,b,c

1 -4 8
The roots are imaginary
Root1:2.0+i4.0
Root2:2.0-i4.0

C:\Users\anshu\Desktop\1BM21CS025>java deploy
Enter the coefficients a,b,c

1 10 5
The roots are real and distinct
Root 1:-1.0557280900008408
root 2:-1.0557280900008408

C:\Users\anshu\Desktop\1BM21CS025>java deploy
Enter the coefficients a,b,c

2 4 2
The roots are real and equal
Root1:-1.0
Root2:-1.0
```

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.

```
→ import java.util.Scanner;
class Student
{
    String name, usn;
    int marks[] = new int[5];
    int credits[] = new int[5];

    void input()
    {
        Scanner s = new Scanner(System.in);
        System.out.println("Enter your name : ");
        name = s.nextLine();
        System.out.println("Enter your usn : ");
        usn = s.nextLine();

        System.out.println("Enter the marks of each subject : ");
        for (int i=0; i<5; i++)
        {
            marks[i] = s.nextInt();
        }

        System.out.println("Enter the no. of credits for each subject : ");
        for (int j=0; j<5; j++)
        {
            credits[j] = s.nextInt();
        }
    }
}
```

```

void display()
{
    system.out.println ("Name : " + name);
    system.out.println ("usn : " + usn);
    for (int i=0 ; i<5 ; i++)
    {
        system.out.println ("Marks of subject " + (i+1));
        system.out.println ("No. of credits for the subject above = ");
    }
}

void calc()
{
    int gr-point [] = new int [5];
    int sgpa = 0;
    int sum = 0;
    float res;
    for (int i=0 ; i<5 ; i++)
    {
        if (marks[i] >= 90)
            gr-point[i] = 10;
        else if (marks[i] >= 80)
            gr-point[i] = 9;
        else if (marks[i] >= 70)
            gr-point[i] = 8;
        else if (marks[i] >= 60)
            gr-point[i] = 7;
        else if (marks[i] >= 50)
            gr-point[i] = 6;
    }
}

```

```

else if (marks[i] >= 60)
    gr-point[i] = 5;

else if (marks[i] < 35 && marks[i] > 0)
    gr-point[i] = 0;

else
    System.out.println ("Invalid input for " + i + " subject");
    sgpa += (gr-point[i] * credits[i]);
    sum += (credits[i]);
}

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

```

```

class sgpa
{
    public static void main (String arr[])
    {
        Student s1 = new Student();
        s1.input();
        s1.display();
        s1.calc();
    }
}

```

```
C:\Users\anshu\Desktop\1BM21CS025>java Lab2
Enter your name:
Anshu
Enter your usn:
1BM21CS025
Enter the marks of each subject:
80
81
82
83
84
Enter the no. of credits for each subject:
4
3
3
3
1
Name:Anshu
USN:1BM21CS025
Marks of subject1=80
No. of credits for the subject above=4
Marks of subject2=81
No. of credits for the subject above=3
Marks of subject3=82
No. of credits for the subject above=3
Marks of subject4=83
No. of credits for the subject above=3
Marks of subject5=84
No. of credits for the subject above=1
SGPA:9.0
```

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.

```
→ import java.util.Scanner;
class Book
{
    String name, author;
    double price;
    int numPages;
    Book()
    {
        name = " "; author = " ";
        price = 0.0; numPages = 0;
    }
    void input()
    {
        Scanner s = new Scanner(System.in);
        System.out.println("Enter the name of the book:");
        name = s.nextLine();
        System.out.println("Enter the author of the book:");
        author = s.nextLine();
        System.out.println("Enter the price of the book:");
        price = s.nextDouble();
    }
}
```

```

System.out.println ("Enter the number of pages :");
num-pages = s.nextInt();
}

public String toString()
{
    return ("Name : " + name + " \n Author : " + author + " \n Price : "
        + price + "\n Number of pages : " + num-pages + "\n");
}

class Book_main
{
    public static void main (String x[])
    {
        Scanner s = new Scanner (System.in);
        System.out.println ("Enter the number of books");
        int n = s.nextInt();
        Book books [] = new Book [n];
        for (int i=0; i<n; i++)
        {
            books [i] = new Book();
            books [i].input();
            System.out.println ("Book Details : \n");
            System.out.println (books [i].toString());
        }
    }
}

```

```
C:\Users\anshu\Desktop\1BM21CS025>java Lab3
Enter the no. of books:
1
Enter the name of the book:
Harry Potter
Enter the author of the book:
J K Rowling
Enter the price of the book:
3000
Enter the number of pages:
700
Book details:

Name:Harry Potter
Author:J K Rowling
Price:3000.0
Number of pages:700
```

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;  
import java.lang.Math;  
abstract class Shape {  
    int length, breadth;  
    Scanner ss = new Scanner(System.in);  
    abstract void printArea();  
}  
class Rectangle extends Shape {  
    void printArea() {  
        System.out.println("Enter length and breadth");  
        length = ss.nextInt();  
        breadth = ss.nextInt();  
        int area = length * breadth;  
        System.out.println("The area of Rectangle is: " + area);  
    }  
}
```

```

class Triangle extends Shape
{
    void printin()
    {
        System.out.print("Enter base length and height:");
        length = ss.nextInt();
        breadth = ss.nextInt();
        int area = (length * breadth) / 2;
        System.out.println("The area of Triangle is: " + area);
    }
}

class Circle extends Shape
{
    void printArea()
    {
        System.out.print("Enter the radius of circle:");
        length = ss.nextInt();
        double area = Math.PI * (length * length);
        System.out.println("The area of circle is: " + area);
    }
}

class s_main
{
    public static void main (String args[])
    {
        int ch;
        Scanner scan = new Scanner (System.in);
        System.out.println ("In MENU In Select shape 1.Rectangle\n 2.Triangle 3.Circle \n");
        scan.nextLine();
    }
}

```

```
ch = scan.nextInt();
switch(ch)
{
    case 1: Rectangle r1 = new Rectangle();
              r1.printArea();
              break;
    case 2: Triangle t1 = new Triangle();
              t1.printArea();
              break;
    case 3: Circle c1 = new Circle();
              c1.printArea();
              break;
    default: System.out.println("Invalid Input! Try Again!");
}
```

```
C:\Users\anshu\Desktop\1BM21CS025>java Lab4

Select shape-->1.Rectangle 2. Triangle 3.Circle
1
Enter height and width of rectangle
10 20
Area of Rectangle is 200

C:\Users\anshu\Desktop\1BM21CS025>java Lab4

Select shape-->1.Rectangle 2. Triangle 3.Circle
2
Enter height and base of rectangle
10 20
Area of Trianle is 100.0

C:\Users\anshu\Desktop\1BM21CS025>java Lab4

Select shape-->1.Rectangle 2. Triangle 3.Circle
3
Enter radius of Circle
10
Area of Circle is 314.1592653589793
```

5. Develop a Java program to create a class Bank that maintains two kinds of account for its customers, one called savings account and the other current account. The savings account provides compound interest and withdrawal facilities but no cheque book facility. The current account provides cheque book facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below this level, a service charge is imposed. Create a class Account that stores customer name, account number and type of account. From this derive the classes Cur-acct and Sav-acct to make them more specific to their requirements. Include the necessary methods in order to achieve the following tasks:

- a) Accept deposits from customers 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.

The image shows handwritten Java code on a piece of paper. The code starts with a comment '→' followed by 'import java.util.Scanner;'. Below it is another 'import' statement with 'java.lang.Math;' crossed out. Then there is a 'class Account' declaration with a brace '{' on the same line. Following the brace, there are two variable declarations: 'String name, acc-type;' and 'int acc-no;'. The code is written in blue ink.

```
→ import java.util.Scanner;  
import java.lang.Math;  
class Account  
{  
    String name, acc-type;  
    int acc-no;
```

```

        double bal, dep;
Scanner ss = new Scanner(System.in);
void setd() {
    System.out.println("Enter your name:");
    name = ss.nextLine();
    System.out.println("Enter your account number:");
    acc_no = ss.nextInt();
    System.out.println("Enter your account type:");
    acc_type = ss.nextLine();
    System.out.println("Enter the bank balance");
    bal = ss.nextDouble();
}
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 = ss.nextDouble();
    bal += dep;
    System.out.println("Balance amount :" + bal);
}

```

```

boolean acc (String acc-type)
{
    if (acc-type == "Savings")
        return true;
    else if (acc-type == "Current")
        return false;
    else
        return true;
}

class cur-acct extends Account
{
    int penal()
    {
        double min, pen;
        System.out.println ("Enter minimum balance &
            penalty amount if not followed:");
        min = ss.nextDouble();
        pen = ss.nextDouble();
        if (bal < min)
        {
            bal -= pen;
            System.out.println ("Penalty imposed for saving
                insufficient balance");
        }
        else
            return 1;
    }

    void withdrawal()
    {
        double amt;
        System.out.println ("Enter amount to be withdrawn:");
        amt = ss.nextDouble(); int a=penal();
        if (a==1)
        if (bal >= amt)

```

```

    { bal = amt;
      System.out.println ("Account balance after
                           + bal); }

    }
  else
    System.out.println ("The amount can't be withdrawn");
  }

}

class Sav-Acc extends Account
{
  void calcInterest()
  {
    System.out.print ("Enter time and rate of interest");
    double t = ss.nextDouble();
    double r = ss.nextDouble();
    double CI = bal * Math.pow((1+r)/100, t);
    System.out.print ("Compound Interest is " + CI);
    bal = CI;
    System.out.print ("Balance amount: " + bal);
  }

  void withdrawal()
  {
    double amt;
    System.out.print ("Enter amount to be withdrawn");
    amt = ss.nextDouble();
    if (bal >= amt)
    {
      bal -= amt;
    }
  }
}

```

```

        System.out.println ("Account Balance after
withdrawal is: " + bal);
    }
else
    System.out.println ("The amount can't be
withdrawn");
}
}

class Bank
{
public static void main (String args[])
{
Scanner ss = new Scanner (System.in);
Account a1 = new Account();
a1.setd();
if (a1.acc > a1.acc-type)
{
    Sav-Acc s1 = new Sav-Acc();
    s1.name = a1.name;
    s1.acc_no = a1.acc_no;
    s1.acc_type = a1.acc_type;
    s1.bal = a1.bal;
    System.out.println ("Enter your choice : 1. Deposit
2. calculate interest 3. Withdrawal
4. Display 5. Exit ");
    int ch = ss.nextInt();
    switch (ch)
    {
        case 1: s1.deposit(); break;
        case 2: s1.calInterest(); break;
        case 3: s1.withdrawal(); break;
        case 4: s1.disp(); break;
        case 5: exit(0); break;
        default: System.out.println ("Invalid Input");
    }
}
}

```

```

        else
    {
        cur_acct c1 = new cur_acct();
        c1.name = ac.name;
        c1.acc_no = ac.acc_no;
        c1.acc_type = ac.acc_type;
        c1.bal = ac.bal;

        system.out.println ("Enter your choice : 1. Deposit
                            2. Penalty check
                            3. Withdrawl
                            4. Display
                            5. Exit");
        int ch = ss.nextInt();

        switch(ch)
        {
            case 1: c1.deposit(); break;
            case 2: c1.penalty(); break;
            case 3: c1.withdrawl(); break;
            case 4: c1.disp(); break;
            case 5: exit(); break;
            default: system.out.println ("Invalid Input");
        }
    }
}

```

```
C:\Users\anshu\Desktop\1BM21CS025>java Lab5
```

```
Enter your account type:  
1. Savings account  
2. Current account  
1  
Cheque Facility not available  
Enter customer name  
Anshu  
Enter Anshu's account number  
123456789  
Enter balance amount  
10000  
Customer Name:Anshu  
Your account number:123456789  
Your Account Balance:10000.0  
Press 1 to deposit  
1  
Enter amount to be deposited  
1000  
Enter rate of interest  
0.1  
Enter number of times interest applied per time period  
5  
Enter number of time periods  
5  
Interest amount=11055.110110055004  
Balance amount without interest is11000.0  
Available balance after updating is22055.110110055004  
Press 1 to withdraw ammount  
1  
Enter the amount to be withdrawn  
2000  
Available Balance:20055.110110055004
```

6. Write a program that demonstrates handling of exceptions in inheritance trees. 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 WrongAge() when the input age=father's age.

```

import java.util.Scanner;
class WrongAgeException extends Exception {
    public String toString() {
        return ("Entered age is negative");
    }
}
class AgeException extends Exception {
    public String toString() {
        return ("Age entered is either less than zero or greater than that
of the father!");
    }
}
class Father {
    int father-age;
    Father (int x) throws WrongAgeException {
        father-age = x;
        if (father-age < 0) throws new WrongAgeException();
    }
}
class Son extends Father {
    int son-age;
    Son (int x, int y) throws AgeException, WrongAgeException {
        super(x); son-age = y;
        if (son-age < 0) throws new WrongAgeException();
    }
}

```

```

class Lab_7 {
    public static void main (String [] args) {
        try {
            Scanner s = new Scanner (System.in);
            System.out.print ("Enter father's and son's age");
            int x = s.nextInt ();
            int y = s.nextInt ();
            Son so = new Son (y);
            System.out.printf ("Father is %d years old and son is %d years old", x, so.fatherAge, so.sonAge);
        }
    }
}

```

} catch (WrongAgeException wa) {

System.out.println (wa);

} catch (AgeException a) {

System.out.println (a);

}

} catch (Exception e) {

System.out.println ("Enter valid values");

}

}

```
C:\Users\anshu\Desktop\1BM21CS025>java excep
Enter father's age:
30
Enter son's age:
5
Father's age: 30
Son's age: 5

C:\Users\anshu\Desktop\1BM21CS025>java excep
Enter father's age:
30
Enter son's age:
34
Exception handled successfully. Son's age is > than father's age!

C:\Users\anshu\Desktop\1BM21CS025>java excep
Enter father's age:
0
Exception handled successfully. Father's age < 0
```

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.

```
→ import java.util.Scanner;  
class Bms extends Thread {  
    synchronized public void run() {  
        try {  
            int i=0;  
            while (i<5) {  
                sleep(10000);  
                System.out.println("BMS College of Engineering");  
                i++;  
            }  
        } catch (Exception e) {  
        }  
    }  
  
    class Cse extends Thread {  
        synchronized public void run() {  
            try {  
                int i=0;  
                while(i<5) {  
                    sleep(2000);  
                    System.out.println("CSE");  
                    i++;  
                }  
            } catch (Exception e) {  
            }  
        }  
    }  
}
```

Q. Explain Multithreading

Answer: Multithreading is a process in which a single program can perform multiple tasks simultaneously. It allows a program to execute multiple threads of execution, each with its own set of resources and memory.

```
class Main {
    public static void main(String args[]) {
        BMS t1 = new BMS();
        CSE t2 = new CSE();
        t1.start();
        t2.start();
    }
}
```

In this code, two threads are created: t1 of type BMS and t2 of type CSE. Both threads are started simultaneously, allowing the program to perform multiple tasks at once.

```
C:\Users\anshu\Desktop\1BM21CS025>java Main
CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
BMS College of Engineering
BMS College of Engineering
BMS College of Engineering
BMS College of Engineering
```

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.

→ Student

```
package CIE;
```

```
import java.util.*;
```

```
public class Student {
```

```
    public String USN, name;
```

```
    public int sem;
```

```
}
```

External

```
package SEE;
```

```
import CIE.Student;
```

```
import java.util.*;
```

```
public class External extends Student
```

```
Scanner scan = new Scanner(System.in)  
public int m;  
public double earr[];  
public void getData()  
{
```

```
earr = new double[5];  
System.out.println("name: ");  
name = scan.next();  
System.out.println("usn: ");  
usn = scan.nextInt();  
System.out.println("sem: ");  
sem = scan.nextInt();  
System.out.println("SEE marks: ");
```

```
public void setData()
```

```
{ for (int i=0; i<5; i++)
```

```
{ earr[i] = scan.nextDouble();  
earr[i] = (double) earr[i]/2;
```

```
}
```

1 student 20
2 student 20
3 student 20
4 student 20
5 student 20

Internals

```
package CIE;
import java.util.*;
import SEF.External;
public class Internals extends External
{
    Scanner scan = new Scanner(System.in)
    public double arr[]; no. of input
    public int n; () function - answer
    public void getdata()
    {
        arr = new double[5];
        for (int i=0; i<5; i++)
            arr[i] = scan.nextDouble();
    }
}
```

result

```
import CIE.Student;
import CIE.Internals;
import SEF.External;
import java.util.*;
class result
{
    public static void main (String args[])
    {
        double res;
```

```

Scanner scan = new Scanner (System.in);
int n, j;
System.out.println ("Enter the no. of students:");
n = scan.nextInt();
Internal ie[] = new Internal[n];
External ex[] = new External[n];
for (j=0; j<n; j++)
{
    ie[j] = new Internal();
    ex[j] = new External();
    System.out.print ("Enter student " + (j+1));
    ex[j].getdata();
    ex[j].setdata();
    System.out.print ("Enter the CIE and SEE marks:");
    ie[j].getdata();
    for (int i=0; i<5; i++)
    {
        System.out.print ("The Total marks is:");
        System.out.println ("-----");
        ex[j].each[i] = ie[j].arr[i];
    }
}

```

```
C:\Users\anshu\Desktop\JAVA LAB>javac Student.java  
C:\Users\anshu\Desktop\JAVA LAB>javac External.java  
C:\Users\anshu\Desktop\JAVA LAB>javac Internals.java  
C:\Users\anshu\Desktop\JAVA LAB>javac result.java  
  
C:\Users\anshu\Desktop\JAVA LAB>java result  
Enter the no. of students :  
1  
--> Student 1  
name:  
Anshu  
usn:  
1BM21CS025  
sem:  
3  
SEE marks:  
70  
71  
72  
73  
74  
Enter the CIE and SEE marks:  
30 34  
30 35  
30 36  
The Total marks is: 65.0  
The Total marks is: 69.5  
The Total marks is: 66.0  
The Total marks is: 71.5  
The Total marks is: 67.0
```