VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.

LAB REPORT
on

Object Oriented Java Programming

(23CS3PCOOJ)

Submitted by

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in partial fulfillment for the award of the degree of
BACHELOR OF ENGINEERING
in

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B.M.S. College of Engineering,
Bull Temple Road, Bangalore 560019
(Affiliated To Visvesvaraya Technological University, Belgaum)
Department of Computer Science and Engineering

CERTIFICATE

This is to certify that the Lab work entitled "Object Oriented Java Programming (23CS3PCOOJ)" carried out by **Somagutta Rakshitha Reddy(1BF24CS296),** who is bonafide student of **B.M.S. College of Engineering.** It is in partial fulfilment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum. The Lab report has been approved as it satisfies the academic requirements in respect of an Object-Oriented Java Programming (23CS3PCOOJ) work prescribed for the said degree.

Dr. Seema Patil Associate Professor Department of CSE, BMSCE	Dr. Kavitha Sooda Professor & HOD Department of CSE, BMSCE

Index

Github Link:
https://github.com/rakshithardy/OOJ

Program 1

Develop a Java program that prints all real solutions to the quadratic equation ax2+bx+c = 0. Read in a, b, c and use the quadratic formula. If the discriminate b2-4ac is negative, display a message stating that there are no real solutions.

Code:

```
import java.util.Scanner;
class LABPGM1
{
    public static void main(String args[])
{
     float a,b,c,d;
     double r1,r2;
     Scanner in=new Scanner(System.in);
    System.out.println("Enter a,b,c values:");
    a=in.nextFloat();
    if(a==0)
    {
        System.out.println("Not a quadratic equation");
        System.out.println("Enter a non zero value...");
        a=in.nextFloat();
    }
    b=in.nextFloat();
    c=in.nextFloat();
    d=(b*b)-(4*a*c);
    if(d==0)
    {
        r1=(-b)/(2*a);
        System.out.println("Roots are real and equal");
        System.out.println(r1+" and "+r1);

    }
    else if(d>0)
    {
        System.out.println("Roots are real and distinct");
        r1=((-b)+(Math.sqrt(d)))/(double)(2*a);
        r2=((-b)-(Math.sqrt(d)))/(double)(2*a);
        System.out.println(r1+" and "+r2);    }
```

```
    else
    {
        System.out.println("Roots are imaginary");
        r1=(-b)/(2*a);
        r2=Math.sqrt(-d)/(2*a);
        System.out.println(r1+"+i("+r2+")");
        System.out.println(r1+"-i("+r2+")");
    }
}
}
```

OUTPUT:

```
PS C:\1BF24CS296> cd "c:\1BF24CS296\" ; if ($?) { javac LABPGM1.java } ; if ($?) { java LABPGM1 }
Enter a,b,c values:
1 -5 6
Roots are real and distinct
3.0 and 2.0
PS C:\1BF24CS296> cd "c:\1BF24CS296\" ; if ($?) { javac LABPGM1.java } ; if ($?) { java LABPGM1 }
Enter a,b,c values:
1 -4 4
Roots are real and equal
2.0 and 2.0
PS C:\1BF24CS296> cd "c:\1BF24CS296\" ; if ($?) { javac LABPGM1.java } ; if ($?) { java LABPGM1 }
Enter a,b,c values:
3 1 2
Roots are imaginary
-0.1666666716337204+i(0.7993052538854531)
-0.1666666716337204-i(0.7993052538854531)
PS C:\1BF24CS296> cd "c:\1BF24CS296\" ; if ($?) { javac LABPGM1.java } ; if ($?) { java LABPGM1 }
Enter a,b,c values:
0
Not a quadratic equation
Enter a non zero value...
1 -5 -6
Roots are real and distinct
6.0 and -1.0
```

Program 2

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

Code:

```
import java.util.Scanner;
class Subject{
    int subjectMarks;
    int credits;
    int grade;
}
class Student{
    String name;
    String USN;
    double SGPA;
    Scanner s;
    Subject subject[];
    Student(){
        s=new Scanner(System.in);
        subject= new Subject[8];
        for(int i=0;i<8;i++){
            subject[i]=new Subject();
        }
    }
    void getstudentdetails(){
        System.out.print("Enter student name:");
        name=s.nextLine();
        System.out.print("Enter student USN:");
        USN=s.nextLine();
    }
    void getmarks(){
        for(int i=0;i<8;i++){
            System.out.println("Enter marks for subject"+(i+1)+":");
            subject[i].subjectMarks=s.nextInt();
            System.out.println("Enter credits for subject"+(i+1)+":");
            subject[i].credits=s.nextInt();
            subject[i].grade=(subject[i].subjectMarks/10)+1;
            if (subject[i].grade==11){
                subject[i].grade=10;
            }
```

```
            if (subject[i].grade<=4){
                subject[i].grade=0;
            }
        }
    }
    void computeSGPA(){
        int Score=0;
        int TotalCredits=0;
        for(int i=0;i<8;i++){
            Score+=(subject[i].grade*subject[i].credits);
            TotalCredits+=subject[i].credits;
        }
        SGPA=(double)Score/(double)TotalCredits;
    }
    void display(){
        System.out.println("Student details:");
        System.out.println("Name: "+name);
        System.out.println("USN: "+USN);
        System.out.println("SGPA: "+ SGPA);
    }
}
class StudentSGPA{
        public static void main(String args[]){
            for(int i=0;i<2;i++){
                Student student=new Student();
                student.getstudentdetails();
                student.getmarks();
                student.computeSGPA();
                student.display();
            }
    }
}
```

```
Enter student name:RAKSHITHA
Enter student USN:1BF24CS296
Enter marks for subject1:
99
Enter credits for subject1:
4
Enter marks for subject2:
89
Enter credits for subject2:
2
Enter marks for subject3:
89
Enter credits for subject3:
1
Enter marks for subject4:
92
Enter credits for subject4:
4
Enter marks for subject5:
97
Enter credits for subject5:
3
Enter marks for subject6:
91
Enter credits for subject6:
3
Enter marks for subject7:
89
Enter credits for subject7:
1
Enter marks for subject8:
90
Enter credits for subject8:
2
Student details:
Name: RAKSHITHA
USN: 1BF24CS296
SGPA: 9.8
Enter student name:SANJUSHA
Enter student USN:1BF24CS302
Enter marks for subject1:
94
```

```
Enter marks for subject1:
94
Enter credits for subject1:
4
Enter marks for subject2:
88
Enter credits for subject2:
3
Enter marks for subject3:
64
Enter credits for subject3:
1
Enter marks for subject4:
71
Enter credits for subject4:
1
Enter marks for subject5:
91
Enter credits for subject5:
3
Enter marks for subject6:
93
Enter credits for subject6:
3
Enter marks for subject7:
74
Enter credits for subject7:
1
Enter marks for subject8:
99
Enter credits for subject8:
4
Student details:
Name: SANJUSHA
USN: 1BF24CS302
SGPA: 9.5
PS C:\1BF24CS296>
```

Program 3

Create a class Book which contains four members: name, author,price, num_pages. Include a constructor to set the values for the members. Include methods to set and get the details of the objects. Include a toString( ) method that could display the complete details of the book. Develop a Java program to create n book objects.

Code:

```
import java.util.Scanner;
class Books{
    String name;
    String author;
    int price;
    int numpages;
    Books( String name,String author,int price,int numpages){
        this.name=name;
        this.author=author;
        this.price=price;
        this.numpages=numpages;
    }
    public String tostring(){
        String name,author,price,numpages;
        name="Book name:"+this.name+"\n";
        author="Author name:"+this.author+"\n";
        price="Price:"+this.price+"\n";
        numpages="Number of pages:"+this.numpages+"\n";
        return name+author+price+numpages;
    }
}
class Book{
    public static void main(String[] args) {
        Scanner s=new Scanner(System.in);
        int n=s.nextInt();
        s.nextLine();
        Books[] b=new Books[n];
        String name;
        String author;
        int price;
        int numpages;
        for(int i=0;i<n;i++){
            System.out.println("Enter book name:");
            name=s.nextLine();
```

```
            System.out.println("Enter author name:");
            author=s.nextLine();
            System.out.println("Enter book price:");
            price = s.nextInt();
            System.out.println("Enter number of:");
            numpages = s.nextInt();
            s.nextLine();
            b[i]=new Books(name, author, price, numpages);
            System.out.println(b[i].tostring());
        }
        s.close();
    }
}
```

OUTPUT:

```
Enter number of books: 2
Enter Details of book 1:
Enter book name: R D SHARMA
Enter author name: SHARMA AND SONS
Enter price: 1999
Enter number of pages: 599
Enter Details of book 2:
Enter book name: PRIDE AND PREJUDICE
Enter author name: JANE AUSTEN
Enter price: 799
Enter number of pages: 216
Book name: R D SHARMA
Author name: SHARMA AND SONS
Price: 1999
Number of pages: 599

Book name: PRIDE AND PREJUDICE
Author name: JANE AUSTEN
Price: 799
Number of pages: 216
```

Program 4

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

Code:

```
import java.util.Scanner;
class InputScanner{
    Scanner sc=new Scanner(System.in);
}
abstract class shape extends InputScanner{
    int dim1,dim2;
    abstract void input();
    abstract void printArea();
}
class Rectangle extends shape{
    void input(){
        System.out.println("Enter the dimensions of the rectangle(length
and breadth):");
        dim1=sc.nextInt();
        dim2=sc.nextInt();
    }
    void printArea(){
        double area=(double)dim1*dim2;
        System.out.println("Area of the rectangle:"+area);
    }
}
class Circle extends shape{
    void input(){
        System.out.println("Enter the dimensions of the circle(radius):");
        dim1=sc.nextInt();
    }
    void printArea(){
        double area=Math.PI*dim1*dim1;
        System.out.println("Area of the circle:"+area);
    }
}
class Triangle extends shape{
    void input(){
        System.out.println("Enter the dimensions of the triangle(base and
```

```
height):");
        dim1=sc.nextInt();
        dim2=sc.nextInt();
    }
    void printArea(){
        double area=0.5*dim1*dim2;
        System.out.println("Area of the triangle:"+area);
    }
}
public class Abstractdemo{
    public static void main(String[] args) {
        Rectangle r = new Rectangle();
        r.input();
        Triangle t = new Triangle();
        t.input();
        Circle c = new Circle();
        c.input();
        r.printArea();
        t.printArea();
        c.printArea();
    }
}
```

OUTPUT:

```
Enter the dimensions of the rectangle(length and breadth):
20 30
Enter the dimensions of the triangle(base and height):
30 60
Enter the dimensions of the circle(radius):
100
Area of the rectangle:600.0
Area of the triangle:900.0
Area of the circle:31415.926535897932
```

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.

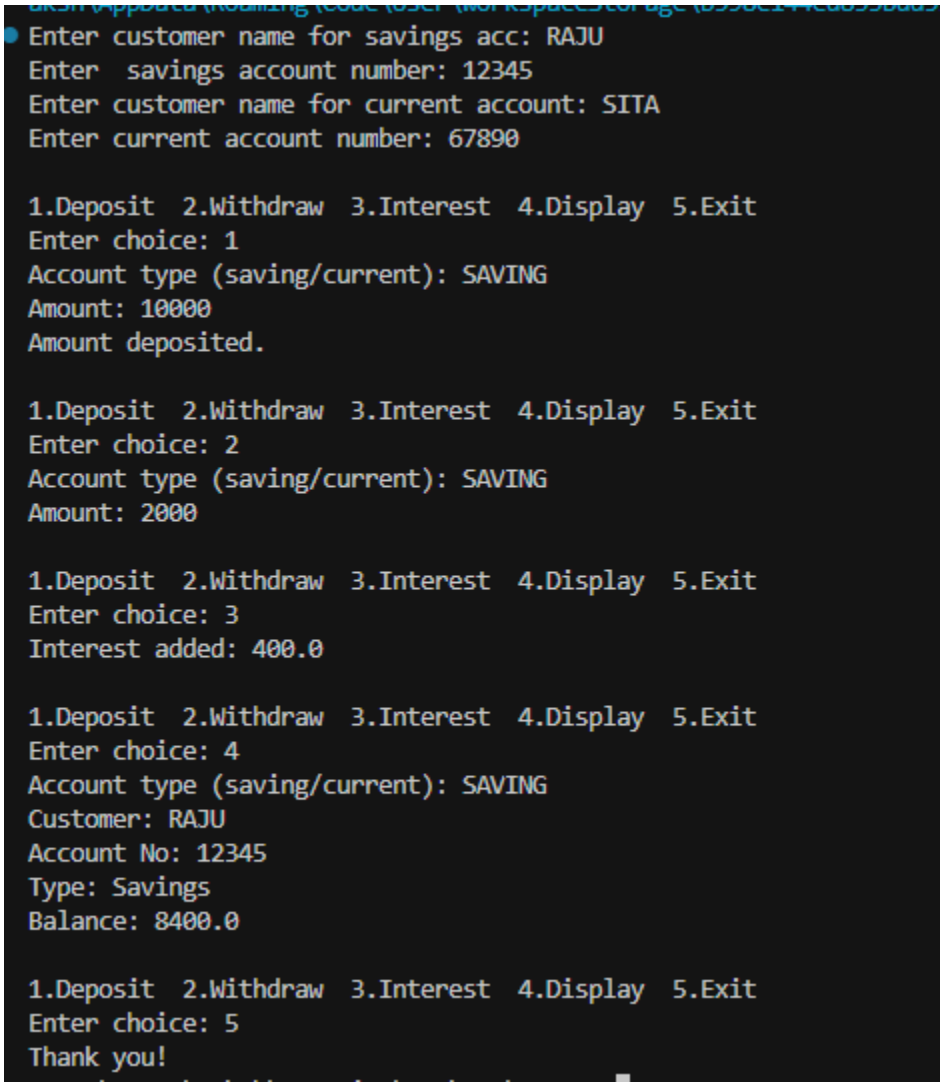
Code:

```
import java.util.Scanner;
class Account {
    String name,type;
    int accNo;
    double balance;
    void account(String n, int no, String t) {
        name = n;
        accNo = no;
        type = t;
        balance = 0.0;
    }
    void deposit(double amt) {
        balance += amt;
        System.out.println("Amount deposited.");
    }
    void display() {
        System.out.println("Customer: " + name);
        System.out.println("Account No: " + accNo);
        System.out.println("Type: " + type);
        System.out.println("Balance: " + balance);
    }
}
class Savings extends Account {
    void interest() {
        double i = balance * 0.05;
        balance += i;
        System.out.println("Interest added: " + i);
    }
    void withdraw(double amt) {
        if (amt <= balance)
             balance -= amt;
        else
            System.out.println("Insufficient balance!");
```

```
    }
}
class Current extends Account {
    void withdraw(double amt) {
        balance -= amt;
        if (balance < 500) {
            balance -= 50;
            System.out.println("Service charge imposed.");
        }
    }
}
public class bankaccount{
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        Savings s = new Savings();
        Current c = new Current();
        System.out.print("Enter customer name for savings acc: ");
        String n1 = sc.next();
        System.out.print("Enter  savings account number: ");
        int a1 = sc.nextInt();
        s.account(n1, a1, "Savings");
        System.out.print("Enter customer name for current account: ");
        String n2 = sc.next();
        System.out.print("Enter current account number: ");
        int a2 = sc.nextInt();
        c.account(n2, a2, "Current");
        int ch;
        do {
            System.out.println("\n1.Deposit  2.Withdraw  3.Interest
4.Display  5.Exit");
            System.out.print("Enter choice: ");
            ch = sc.nextInt();
            switch (ch) {
                case 1 -> {
                    System.out.print("Account type (saving/current): ");
                    String t = sc.next();
                    System.out.print("Amount: ");
                    double d = sc.nextDouble();
                    if (t.equalsIgnoreCase("saving"))
                        s.deposit(d);
```

```
                    else
                        c.deposit(d);
                }
                case 2 -> {
                    System.out.print("Account type (saving/current): ");
                    String t = sc.next();
                    System.out.print("Amount: ");
                    double w = sc.nextDouble();
                    if (t.equalsIgnoreCase("saving"))
                        s.withdraw(w);
                    else
                        c.withdraw(w);
                }
                case 3 -> s.interest();
                case 4 -> {
                    System.out.print("Account type (saving/current): ");
                    String t = sc.next();
                    if (t.equalsIgnoreCase("saving"))
                        s.display();
                    else
                        c.display();
                }
                case 5 -> System.out.println("Thank you!");
                default -> System.out.println("Invalid choice!");
            }
        } while (ch != 5);
        sc.close();
    }
}
```

OUTPUT:


Enter customer name for savings acc: RAJU
Enter savings account number: 12345
Enter customer name for current account: SITA
Enter current account number: 67890
1.Deposit 2.Withdraw 3.Interest 4.Display 5.Exit
Enter choice: 1
Account type (saving/current): SAVING
Amount: 10000
Amount deposited.
1.Deposit 2.Withdraw 3.Interest 4.Display 5.Exit
Enter choice: 2
Account type (saving/current): SAVING
Amount: 2000
1.Deposit 2.Withdraw 3.Interest 4.Display 5.Exit
Enter choice: 3
Interest added: 400.0
1.Deposit 2.Withdraw 3.Interest 4.Display 5.Exit
Enter choice: 4
Account type (saving/current): SAVING
Customer: RAJU
Account No: 12345
Type: Savings
Balance: 8400.0
1.Deposit 2.Withdraw 3.Interest 4.Display 5.Exit
Enter choice: 5
Thank you!

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.

Code:

Project

- CIE
  - internals.java
  - student.java
- SEE
  - externals.java
- main.java

internals.java

```
package project.CIE;
import java.util.Scanner;
public class internals extends student {
    protected int ciemarks[] = new int[5];
    public void inputCIEmarks() {
        Scanner s = new Scanner(System.in);
        System.out.println("Enter CIE marks of 5 subjects:");
        for (int i = 0; i < 5; i++) {
            System.out.print("Subject " + (i + 1) + ": ");
            ciemarks[i] = s.nextInt();
        }
    }
}
```

Student.java

```
package project.CIE;
import java.util.Scanner;
public class student {
    protected String usn;
    protected String name;
    protected int sem;
    public void inputStudentDetails() {
        Scanner s = new Scanner(System.in);
```

```
        System.out.print("Enter USN: ");
        usn = s.nextLine();
        System.out.print("Enter Name: ");
        name = s.nextLine();
        System.out.print("Enter Semester: ");
        sem = s.nextInt();
    }
    public void displayStudentDetails() {
        System.out.println("\nUSN: " + usn);
        System.out.println("Name: " + name);
        System.out.println("Semester: " + sem);
    }
}
```

externals.java

```
package project.SEE;
import project.CIE.internals;
import java.util.Scanner;
public class externals extends internals {
    protected int marks[];
    protected int finalMarks[];
    public externals() {
        marks = new int[5];
        finalMarks = new int[5];
    }
    public void inputSEEmarks() {
        Scanner s = new Scanner(System.in);
        System.out.println("Enter SEE marks of 5 subjects:");
        for (int i = 0; i < 5; i++) {
            System.out.print("Subject " + (i + 1) + ": ");
            marks[i] = s.nextInt();
        }
    }
    public void calculateFinalMarks() {
        for (int i = 0; i < 5; i++) {
            finalMarks[i] = ciemarks[i] + this.marks[i]/2;
        }
    }
    public void displayFinalMarks() {
        displayStudentDetails();
```

```
        System.out.println("\nFinal Marks in 5 Subjects:");
        for (int i = 0; i < 5; i++) {
            System.out.println("Subject " + (i + 1) + ": " +
finalMarks[i]);
        }
    }
}
```

main.java

```
package project;
import project.SEE.externals;
public class main {
    public static void main(String args[]) {
        externals s = new externals();
        System.out.println("Enter Student Details:");
        s.inputStudentDetails();
        System.out.println("\nEnter Internal Marks:");
        s.inputCIEmarks();
        System.out.println("\nEnter SEE Marks:");
        s.inputSEEmarks();
        s.calculateFinalMarks();
        System.out.println("\n---- FINAL RESULT ----");
        s.displayFinalMarks();
    }
}
```

OUTPUT:

```
Enter Student Details:
Enter USN: 1BF24CS296
Enter Name: RAKSHITHA
Enter Semester: 1

Enter Internal Marks:
Enter CIE marks of 5 subjects:
Subject 1: 45
Subject 2: 45
Subject 3: 45
Subject 4: 45
Subject 5: 45

Enter SEE Marks:
Enter SEE marks of 5 subjects:
Subject 1: 90
Subject 2: 90
Subject 3: 90
Subject 4: 90
Subject 5: 90

---- FINAL RESULT ----

USN: 1BF24CS296
Name: RAKSHITHA
Semester: 1

Final Marks in 5 Subjects:
Subject 1: 90
Subject 2: 90
Subject 3: 90
Subject 4: 90
Subject 5: 90
PS C:\Users\Admin\Desktop\1BF24CS296>
```

Program 7

Write a program that demonstrates handling of exceptions in inheritance tree. Create a base class called “Father” and derived class called “Son” which extends the base class. In Father class, implement a constructor which takes the age and throws the exception WrongAge( ) when the input age<0. In Son class,implement a constructor that cases both father and son’s age and throws an exception if son’s age is>=father’s age.

Code:

```
import java.util.Scanner;
class WrongAge extends Exception {
    public WrongAge() {
        super("Age Error");
    }
    public WrongAge(String message) {
        super(message);
    }
}
class InputScanner {
    protected static final Scanner s = new Scanner(System.in);
}

class Father extends InputScanner {
    protected int fatherAge;

    public Father() throws WrongAge {
        System.out.print("Enter father's age: ");
        fatherAge = s.nextInt();
        if (fatherAge < 0) {
            throw new WrongAge("Age cannot be negative");
        }
    }
    public void display() {
        System.out.println("Father's age: " + fatherAge);
    }
}
class Son extends Father {
    private int sonAge;
    public Son() throws WrongAge {
        super();
        System.out.print("Enter son's age: ");
        sonAge = InputScanner.s.nextInt();
```

```
        if (sonAge < 0) {
            throw new WrongAge("Age cannot be negative");
        } else if (sonAge >= fatherAge) {
            throw new WrongAge("Son's age cannot be greater than or equal
to father's age");
        }
    }
    public void display() {
        super.display();
        System.out.println("Son's age: " + sonAge);
    }
}
public class AgeExceptionDemo {
    public static void main(String[] args) {
        try {
            Son son = new Son();
            son.display();
        } catch (WrongAge e) {
            System.out.println("Error: " + e.getMessage());
        } catch (Exception e) {
            System.out.println("Unexpected error: " + e.getMessage());
        }
    }
}
```

OUTPUT:

```
emo }
Enter father's age: -25
Error: Age cannot be negative
PS C:\Users\Admin\Desktop\1BF24CS296> cd "c:\Users\Admin\Desktop\1BF24CS296\" ; if ($?) { javac AgeExceptionDemo.java } ; if ($?) { java AgeExceptionD
emo }
Enter father's age: 45
Enter son's age: 56
Error: Son's age cannot be greater than or equal to father's age
PS C:\Users\Admin\Desktop\1BF24CS296> cd "c:\Users\Admin\Desktop\1BF24CS296\" ; if ($?) { javac AgeExceptionDemo.java } ; if ($?) { java AgeExceptionD
emo }
Enter father's age: 45
Enter son's age: -5
Error: Age cannot be negative
PS C:\Users\Admin\Desktop\1BF24CS296> cd "c:\Users\Admin\Desktop\1BF24CS296\" ; if ($?) { javac AgeExceptionDemo.java } ; if ($?) { java AgeExceptionD
emo }
Enter father's age: 45
Enter son's age: 20
Father's age: 45
Son's age: 20
PS C:\Users\Admin\Desktop\1BF24CS296>
```

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() {
        for(int i = 1; i <= 5; i++) {
            System.out.println("BMS College of Engineering");
            try {
                 Thread.sleep(10000);
                 } catch (Exception e) {}
        }
    }
}
class CS extends Thread {
    public void run() {
        for(int i = 1; i <= 5; i++) {
            System.out.println("CSE");
            try {
                Thread.sleep(2000);
            } catch (Exception e) {}
        }
    }
}
public class MULTITHREADING {
    public static void main(String args[]) {
        BMS c1 = new BMS();
        c1.start();

        CS c2 = new CS();
        c2.start();
    }
}
```

OUTPUT:

```
BMS College of Engineering
PS C:\Users\Admin\Desktop\1BF24CS296> cd "c:\Users\Admin\Desktop\1BF24CS296\" ; if ($?) { javac MULTITHREADING.java } ; if ($?) { java MULTITHREADING }
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
BMS College of Engineering
BMS College of Engineering
BMS College of Engineering
PS C:\Users\Admin\Desktop\1BF24CS296>
```