B.M.S. College of Engineering

(Autonomous Institution affiliated to VTU, Belagavi)

Department of Computer Science and Engineering

AAT

JAVA

LABORTA

RY Report

23CS3PCOOJ

(December 2023-March 2024)

B.M.S. College of Engineering

Department of Computer Science and Engineering

Laboratory Certificate

This is to certify that Chandrakala KM has satisfactorily completed the course of Experiments in Practical JAVA OBJECT ORIENTED PROGRAMMING LANGUAGE prescribed by the Department during the odd semester 2023-24.
Name of the Candidate: Chandrakala KM

USN No.: **2023BMS02702** Semester: **III** Section: **B**

Marks	
Max. Marks	Obtained
10	
Marks in Words	

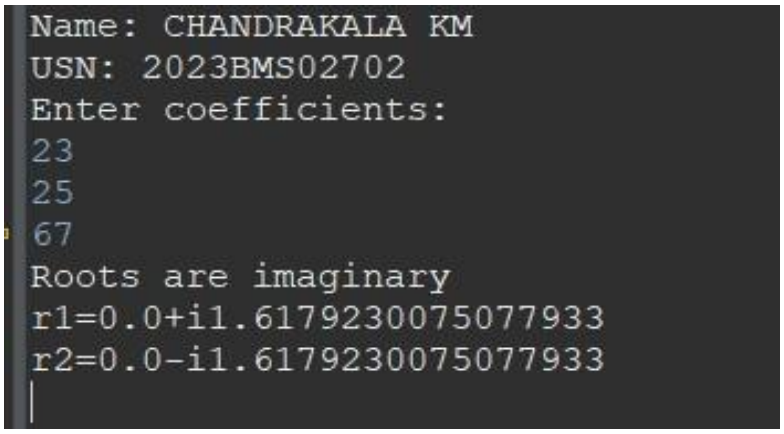
Signature of the staff in-charge **Head of the Department**

Date:

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.

```
package JAAVA_lab_programs;

import java.util.Scanner;
public class Quad {
	int a,b,c;
	double d,r1,r2;
	void input(){
	Scanner sc=new Scanner(System.in);
	System.out.println("Enter coefficients:");
	a=sc.nextInt();
	b=sc.nextInt();
	c=sc.nextInt();
}
	void calc(){
		double d=(b*b)-(4*a*c);
		if(a==0||b==0||c==0){
			System.out.println("invalid inputs");
		}
		else if(d>0){
		System.out.println("roots are real and distinct");
		r1=(-b+(Math.sqrt(d))/(2*a));
		r2=(-b-(Math.sqrt(d))/(2*a));
		System.out.println("r1="+r1);
		System.out.println("r2="+r2);
		}
		else if(d==0){
		System.out.println("Roots are real and equal");
		r1=r2=-b/(2*a);
		System.out.println("r1="+r1);
		System.out.println("r2="+r2);
		}
		else{
		System.out.println("Roots are imaginary");
		r1=-b/(2*a);
		r2=Math.sqrt(-d)/(2*a);
		System.out.println("r1="+r1+"+i"+r2);
		System.out.println("r2="+r1+"-i"+r2);
		}
		}

		public static void main(String args[]){
		Quad q=new Quad();
		q.input();
		q.calc();
		}
		}
```

OUTPUT:



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.

```
package JAAVA_lab_programs;
import java.util.Scanner;

public class Student {
        String USN, name;
        int marks[] = new int[6];
        double percentage;

        // Method to accept student details and marks
        void acceptDetails() {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter USN: ");
        USN = sc.nextLine();
        System.out.print("Enter name: ");
        name = sc.nextLine();
        System.out.println("Enter marks for 6 subjects:");
        for (int i = 0; i < 6; i++) {
        marks[i] = sc.nextInt();
        }
        }
        // Method to calculate percentage
        void calculatePercentage() {
        int totalMarks = 0;
        for (int mark : marks) { totalMarks += mark;
        }
        percentage = (double) totalMarks / 600 * 100;
        }
```

```
        // Method to display student details
        void displayDetails() {
        System.out.println("USN: " + USN);
        System.out.println("Name: " + name);
        System.out.println("Marks: " + marks[0] + ", " + marks[1] +
        ", " + marks[2] + ", " + marks[3] + ", " + marks[4] + ", " + marks[5]);
        System.out.println("Percentage: " + percentage + "%");
        }

        public static void main(String[] args) {
                System.out.println("Name: CHANDRAKALA KM");
                System.out.println("USN: 2023BMS02702");
                int numStudents;
                Scanner sc = new Scanner(System.in);
                System.out.print("Enter the number of students: ");
                numStudents = sc.nextInt();
                Student[] students = new Student[numStudents];
                // Accept details for each student
                for (int i = 0; i < numStudents; i++) {
                        students[i] = new Student(); students[i].acceptDetails();
                        students[i].calculatePercentage();
                }
                // Display details of all students
                System.out.println("\nStudent Details:");
                for (Student student : students) {
                        student.displayDetails();
                        System.out.println();
                }
        }
}
```

OUTPUT:

```
Name: CHANDRAKALA KM
USN: 2023BMS02702
Enter the number of students:
2
Enter USN: 2023BMS02702
Enter name: CHANDU
Enter marks for 6 subjects:
99
70
65
90
88
90
Enter USN: 2023BMS02703
Enter name: PRIYA
Enter marks for 6 subjects:
99
98
88
99
78
69

Student Details:
USN: 2023BMS02702
Name: CHANDU
Marks: 99, 70, 65, 90, 88, 90
Percentage: 83.66666666666667%

USN: 2023BMS02703
Name: PRIYA
Marks: 99, 98, 88, 99, 78, 69
Percentage: 88.5%
```

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.

```
package JAAVA_lab_programs;

import java.util.Scanner;
public class Book {
	String name,author;
	int price,no_pages;
	Book(String name,String author,int no_pages,int price){
		this.name=name;
		this.author=author;
		this.price=price;
		this.no_pages=no_pages;
	}
	public String toString() {
		String name,price,author,no_pages;
		name="book name:" + this.name +"\n";
		author="author name:" + this.author +"\n";
		price="price:" +this.price +"\n";
```

```
            no_pages="no_pages:" +this.no_pages +"\n";
            return name + author + price + no_pages;
        }
        public static void main(String args[]) {
            System.out.println("Name: CHANDRAKALA KM");
            System.out.println("USN: 2023BMS02702");
            Scanner s=new Scanner(System.in);
            System.out.println("enter the number of books:");
            int n=s.nextInt();
            Book b[];
            b=new Book[n];
            for(int i=0;i<n;i++) {
                System.out.println("BOOK " + (i+1)+ ":");
                System.out.println("Enter name of book:");
                String name=s.next();
                System.out.println("enter author:");
                String author=s.next();
                System.out.println("enter price:");
                int price=s.nextInt();
                System.out.println("Enter no of pages:");
                int nopages=s.nextInt();
                b[i]=new Book(name,author,price,nopages);

            }
            for(int i=0;i<n;i++) {
                System.out.println("Book"+(i+1)+"\n"+b[i]);
            }
        }
```

OUTPUT:

```
Name: CHANDRAKALA KM
USN: 2023BMS02702
Enter the number of students:
2
Enter USN: 2023BMS02702
Enter name: CHANDU
Enter marks for 6 subjects:
99
70
65
90
88
90
Enter USN: 2023BMS02703
Enter name: PRIYA
Enter marks for 6 subjects:
99
98
88
99
78
69

Student Details:
USN: 2023BMS02702
Name: CHANDU
Marks: 99, 70, 65, 90, 88, 90
Percentage: 83.66666666666667%

USN: 2023BMS02703
Name: PRIYA
Marks: 99, 98, 88, 99, 78, 69
Percentage: 88.5%
```

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.

```
package JAAVA_lab_programs;

abstract  class Shape {
        int a,b;
        Shape(int a,int b){
                this.a=a; this.b=b;
        }
        public abstract void printArea();
        }


package JAAVA_lab_programs;

public class Rectangle extends Shape{
        Rectangle(int length,int breadth){
        super(length,breadth);
        }
```

```
        public void printArea(){
        System.out.println("Area of Rectangle = "+(a*b));
        }
        }
```

```
package JAAVA_lab_programs;

public class Triangle extends Shape{
        Triangle(int base,int height){
        super(base,height);
        }
        public void printArea(){
        System.out.println("Area of Triangle = "+(0.5*a*b));
        }
        }
```

```
package JAAVA_lab_programs;

public class Circle extends Shape{
        Circle(int radius){
        super(radius,0);
        }
        public void printArea(){
        System.out.println("Area of Circle = "+(Math.PI*a*a));
        }
}
```

```
package JAAVA_lab_programs;

import java.util.Scanner;
public class Area {

        public static void main(String[] args) {
                System.out.println("Name: CHANDRAKALA KM");
                System.out.println("USN: 2023BMS02702");

                Scanner sc= new Scanner(System.in);
                System.out.println("Enter length and breadth of Rectangle");
                int length=sc.nextInt();
                int breadth=sc.nextInt();
                System.out.println("Enter base and height of Triangle");
                int base=sc.nextInt();
                int height=sc.nextInt();
                System.out.println("Enter radiius of a Circle");
                int radiius=sc.nextInt();
                Rectangle rectangle=new Rectangle(length, breadth);
                Triangle triangle=new Triangle(base, height);
                Circle circle=new Circle(radiius);
```

```
                rectangle.printArea();
                triangle.printArea();
                circle.printArea();
        }

}
```

OUTPUT:

```
Name: CHANDRAKALA KM
USN: 2023BMS02702
Enter the number of students:
2
Enter USN: 2023BMS02702
Enter name: CHANDU
Enter marks for 6 subjects:
99
70
65
90
88
90
Enter USN: 2023BMS02703
Enter name: PRIYA
Enter marks for 6 subjects:
99
98
88
99
78
69

Student Details:
USN: 2023BMS02702
Name: CHANDU
Marks: 99, 70, 65, 90, 88, 90
Percentage: 83.66666666666667%

USN: 2023BMS02703
Name: PRIYA
Marks: 99, 98, 88, 99, 78, 69
Percentage: 88.5%
```

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 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.

```
package JAAVA_lab_programs;

import java.util.Scanner;
public class Account {
	protected String name;
	protected int accno;
	protected double balance;

	public void get_info() {
	Scanner sc = new Scanner(System.in);
	System.out.print("Enter Name: ");
	name = sc.nextLine();
	System.out.print("Enter Account Number: ");
	accno = sc.nextInt();
	}

	public void deposit(double amount) {
	balance += amount;
	System.out.println("Amount deposited successfully.");
	}

	public void display() {
	System.out.println("Name: " + name);
	System.out.println("Account Number: " + accno);
	System.out.println("Balance: " + balance);
	}
}
package JAAVA_lab_programs;

public class Cur_acct extends Account {
	private final double min_balance = 500;
	private final double penalty = 100;


	public void withdraw(double amount) {
	if (balance - amount >= min_balance) {
	balance -= amount;
	System.out.println("Amount withdrawn successfully.");
	}
	else {
	System.out.println("Insufficient balance for withdrawal.");
	}
	check_min_balance();
```

```
        }

        private void check_min_balance() {
        if (balance < min_balance) {
        balance -= penalty;
        System.out.println("Penalty imposed for falling below minimum balance.");
        }
        }
        }
package JAAVA_lab_programs;

public class Sav_acct extends Account {
        private final double interest_rate = 0.04;

        public void compute_interest() {
        double interest = balance * interest_rate; balance += interest;
        System.out.println("Interest credited successfully.");
        }
}
package JAAVA_lab_programs;

import java.util.Scanner;
public class Bank {

        public static void main(String[] args) {
                System.out.println("Name: CHANDRAKALA KM");
                System.out.println("USN: 2023BMS02702");
                Scanner sc = new Scanner(System.in);
                System.out.println("Enter 1 for Current Account or for Savings Account: ");
                int choice = sc.nextInt();
                Account acc;
                if (choice == 1) {
                acc = new Cur_acct();
                }
                else {
                acc = new Sav_acct();
                }
                acc.get_info();
                while (true) {
                System.out.println("\nMenu:");
                System.out.println("1. Deposit");
                System.out.println("2. Withdraw");
                System.out.println("3. Display Balance");
                System.out.println("4. Compute Interest (Savings Account only)");
                System.out.println("5. Exit");
                System.out.print("Enter your choice: ");
                int choice1= sc.nextInt();
                switch (choice1) {
                case 1:
```

```
                System.out.print("Enter amount to deposit: ");
                double amount = sc.nextDouble();
                acc.deposit(amount);
                break;
            case 2:
                if (acc instanceof Sav_acct){
                    System.out.println("Withdrawal not allowed for Savings Account.");
                }
                else {
                    System.out.println("Enter amount to withdraw:");
                    amount = sc.nextDouble();
                ((Cur_acct) acc).withdraw(amount);
                }
                break;
            case 3:
                acc.display();
                break;
            case 4:
                if (acc instanceof Sav_acct) { ((Sav_acct) acc).compute_interest();
                } else {
                System.out.println("Interest computation not applicable for Current Account.");
                }
                break;

            case 5:
                System.exit(0);
            default:
                System.out.println("Invalid choice.");
                }                                    }
            }
    }
```

OUTPUT:

```
Name: CHANDRAKALA KM
USN: 2023BMS02702
Enter 1 for Current Account or for Savings Account:
1
Enter Name: Chandu
Enter Account Number: 235363657

Menu:
1. Deposit
2. Withdraw
3. Display Balance
4. Compute Interest (Savings Account only)
5. Exit
Enter your choice: 1
Enter amount to deposit: 1000
Amount deposited successfully.

Menu:
1. Deposit
2. Withdraw
3. Display Balance
4. Compute Interest (Savings Account only)
5. Exit
Enter your choice: 2
Enter amount to withdraw:
500
Amount withdrawn successfully.

Menu:
1. Deposit
2. Withdraw
3. Display Balance
4. Compute Interest (Savings Account only)
5. Exit
Enter your choice: 3
Name: Chandu
Account Number: 235363657
Balance: 500.0
```

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

// Package CIE:

```
package CIE;

public class Student {
    public String usn, name;
    public int sem;
}


package CIE;

public class Internals extends Student {
    public int[] internalMarks = new int[5];
}
```

// Package SEE:

```
package SEE;

import CIE.Student;

public class External extends Student {
    public int[] seeMarks = new int[5];
}
```

//Main method class:

```
package JAAVA_lab_programs;
import CIE.Internals;
import SEE.External;
import java.util.Scanner;

public class Pkgmain {
    public static void main(String[] args) {
      System.out.println("Name: Chandrakala KM");
      System.out.println("USN: 2023BMS02702");

        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];
        for (int i = 0; i < n; i++) {
            cieStudents[i] = new Internals();
            System.out.println("Enter details for CIE of Student " + (i +
            1) + ":");
            System.out.print("USN: ");
            cieStudents[i].usn = scanner.next();
            System.out.print("Name: ");
            cieStudents[i].name = scanner.next();
            System.out.print("Semester: ");
            cieStudents[i].sem = scanner.nextInt();

            System.out.println("Enter Internal Marks for 5 courses:");
            for (int j = 0; j < 5; j++) {
                System.out.print("Course " + (j + 1) + ": ");
                cieStudents[i].internalMarks[j] = scanner.nextInt();
            }
        }

        // Input SEE marks
        for (int i = 0; i < n; i++) {
            seeStudents[i] = new External();
            System.out.println("Enter details for SEE of Student " +
            (i + 1) + ":");
```

```
            System.out.print("USN: ");
            seeStudents[i].usn = scanner.next();
            System.out.print("Name: ");
            seeStudents[i].name = scanner.next();
            System.out.print("Semester: ");
            seeStudents[i].sem = scanner.nextInt();

            System.out.println("Enter External Marks for 5 courses:");
            for (int j = 0; j < 5; j++) {
                System.out.print("Course " + (j + 1) + ": ");
                seeStudents[i].seeMarks[j] = scanner.nextInt();
            }
        }

        // Display final marks
        System.out.println("\nFinal Marks of Students:");
        for (int i = 0; i < n; i++) {
            System.out.println("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.println("Course " + (j + 1) + ": " +
cieStudents[i].internalMarks[j]);
            }

            System.out.println("SEE Marks:");
            for (int j = 0; j < 5; j++) {
                System.out.println("Course " + (j + 1) + ": " +
seeStudents[i].seeMarks[j]);
            }

            System.out.println();
        }
        scanner.close();
    }
}
```

OUTPUT:

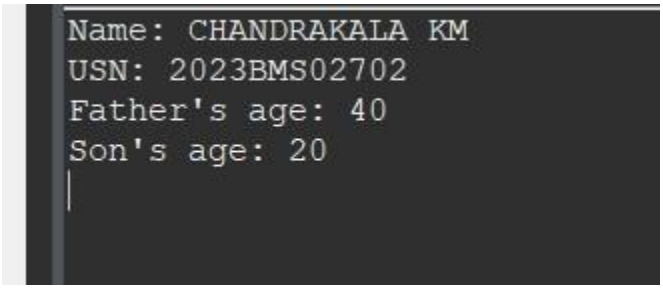
```
Name: Chandrakala KM
USN: 2023BMS02702
Enter the number of students: 1
Enter details for CIE of Student 1:
USN: 2023BMS02702
Name: rkc
Semester: 3
Enter Internal Marks for 5 courses:
Course 1: 90
Course 2: 99
Course 3: 100
Course 4: 99
Course 5: 80
Enter details for SEE of Student 1:
USN: 2023BMS02702
Name: rkc
Semester: 3
Enter External Marks for 5 courses:
Course 1:
90
Course 2: 99
Course 3: 89
Course 4: 90
Course 5: 100

Final Marks of Students:
Student 1:
USN: 2023BMS02702
Name: rkc
Semester: 3
CIE Marks:
Course 1: 90
Course 2: 99
Course 3: 100
Course 4: 99
Course 5: 80
SEE Marks:
Course 1: 90
Course 2: 99
Course 3: 89
Course 4: 90
Course 5: 100
```

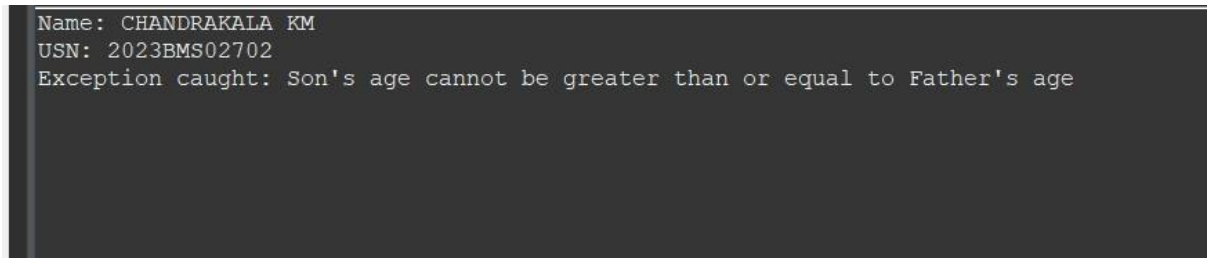
7. Write a program that demonstrates handling of exceptions in inheritance tree. Create a base class called “Father” and derived class called “Son” which extends the base class. In Father class, implement a constructor which takes the age and throws the exception WrongAge( ) when the input age=father’s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

```
package DemoExceptions;

public class WrongAgeException extends Exception {
   public WrongAgeException(String message) {
      super(message);
   }
}

}

package DemoExceptions;

public class Father {
            int age;

   public Father(int age) throws WrongAgeException {
      if (age < 0) {
         throw new WrongAgeException("Age cannot be negative");
      }
      this.age = age;
   }


}
package DemoExceptions;

public class Son extends Father {
               int sonAge;

               public Son(int fatherAge, int sonAge) throws WrongAgeException {
                  super(fatherAge);
                  if (sonAge >= fatherAge) {
                     throw new WrongAgeException("Son's age cannot be greater than or equal to Father's age");
                  }
                  this.sonAge = sonAge;

}
}

package DemoExceptions;

public class Excepmain {
   public static void main(String[] args) {
            System.out.println("Name: CHANDRAKALA KM");
                     System.out.println("USN: 2023BMS02702");
```

```
        try {
            int fatherAge = 40;
            int sonAge = 20;
            Son son = new Son(fatherAge, sonAge);
            System.out.println("Father's age: " + fatherAge);
            System.out.println("Son's age: " + son.sonAge);
        } catch (WrongAgeException e) {
            System.out.println("Exception caught: " + e.getMessage());
        }
    }
}
```

OUTPUT:





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.

```
package DemoThreads;

public class DisplayThread extends Thread{
        private String message;
        private int interval;

        public DisplayThread(String message,int interval) {
                this.message=message;
                this.interval=interval;
        }
        public void run() {
                while(true) {
                        try {
                                System.out.println(message);
                                Thread.sleep(interval);
                        }
```

```
                        catch(InterruptedException e) {
                                e.printStackTrace();
                        }
                }
        }
}

package DemoThreads;

public class Threadmain {
        public static void main(String args[]) {
                System.out.println("Name: CHANDRAKALA KM");
                System.out.println("USN: 2023BMS02702");
                DisplayThread t1=new DisplayThread("BMSCE",10000);
                DisplayThread t2=new DisplayThread("CSE",2000);
                t1.start();
                t2.start();
        }
}
```

OUTPUT:

```
Name: CHANDRAKALA KM
USN: 2023BMS02702
BMSCE
CSE
CSE
CSE
CSE
CSE
BMSCE
CSE
CSE
CSE
CSE
CSE
CSE
BMSCE
CSE
CSE
CSE
CSE
CSE
CSE
BMSCE
```