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
COMPUTER SCIENCE AND ENGINEERING



BENGALURU-560019 Sep-2024 to Jan-2025

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 **ATHARV BORIKAR** (**1BM23IC015**), 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. 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.

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Github Link:

https://github.com/Ath007-dev/Lab-Programs

Program 1
Implement Quadratic Equation

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	else & y (discuminant >0) double root 1 = (-b + Math Sgrt (discriminant)) / (2) double root 2 = (-b - Math Sgrt (discriminant)) / 2)
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	System out printly ("No real extretions);
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1	6 real solutions (documinant a negalare)
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	South the Hall - 4-) - 1 to Marie

```
import java.util.Scanner;
class Quadratic
{ int a, b, c;
  double r1, r2, d;
  void getd()
    Scanner s = new Scanner(System.in);
    System.out.println("Enter the coefficients of a,b,c");
    a = s.nextInt(); b = s.nextInt(); c = s.nextInt();
  void compute()
     while(a==0)
       System.out.println("Not a quadratic equation");
       System.out.println("Enter a non zero value for a:");
       Scanner s = new Scanner(System.in);
       a = s.nextInt();
    d = b*b-4*a*c;
    if(d==0)
       r1 = (-b)/(2*a);
       System.out.println("Roots are real and equal");
       System.out.println("Root1 = Root2 = " + r1);
    else if(d>0)
       r1 = ((-b)+(Math.sqrt(d)))/(double)(2*a);
       r2 = ((-b)-(Math.sqrt(d)))/(double)(2*a);
       System.out.println("Roots are real and distinct");
       System.out.println("Roo1 = " + r1 + "Root2 = " + r2);
    else if(d<0)
       System.out.println("Roots are imaginary");
       r1 = (-b)/(2*a);
       r2 = Math.sqrt(-d)/(2*a);
       System.out.println("Root1 = " + r1 + " + i"+r2);
       System.out.println("Root1 = " + r1 + " - i"+r2);
  }
class QuadraticMain
```

```
public static void main(String args[])
  Quadratic q = new Quadratic();
  q.getd();
q.compute();
```

Program 2 SGPA Calculation

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	Lab Program 2
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	class student &
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```
import java.util.Scanner;
class Subject
{
int subjectMarks;
  int credits;
  int grade;
}
class Student
{
   Subject subject[];
   String name;
   String usn;
   double SGPA;
   Scanner s;
   Student()
```

```
int i;
     subject = new Subject[9];
     for(i=0;i<9;i++)
       subject[i] = new Subject();
    s = new Scanner(System.in);
  void getStudentDetails()
    System.out.print("Enter your Name: ");
    name = s.next();
    System.out.print("Enter your USN: ");
    usn = s.next();
  void getMarks()
     for(int i=0; i<9; i++)
       System.out.print("Enter marks for subject "+(i+1)+" :");
       subject[i].subjectMarks = s.nextInt();
       System.out.print("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 effectiveScore = 0;
    int totalCredits = 0;
    for(int i=0; i<9; i++)
       effectiveScore += (subject[i].grade*subject[i].credits);
       totalCredits += subject[i].credits;
    SGPA = (double)effectiveScore/(double)totalCredits;
class Student_SGPA
  public static void main(String args[])
```

```
Student s1 = new Student();
s1.getStudentDetails();
s1.getMarks();
s1.computeSGPA();
System.out.println("Name: "+s1.name);
System.out.println("USN: "+s1.usn);
System.out.println("SGPA: "+s1.SGPA);
}
}
```

Display Book Details

	Lab Programs
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1	System out prins ("Ender runnlos of pages ");
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	Name: The Great Gotsley Author: F. Scott Fitzerald Price: \$10.99 No y Pages = 180
	ATO 12 Posses = 180

Code: import java.util.Scanner ;

class Main{

```
public static void main(String args[]){
    int n;
    System.out.print("Enter the number of books:");
    Scanner sc = new Scanner(System.in); n = sc.nextInt();
    sc.nextLine();
    Book books[] = new Book[n];
    for(int i = 0; i < n; i++){
       System.out.print("Enter the book name: ");
       String name = sc.nextLine();
       System.out.print("Enter the author name: ");
       String author = sc.nextLine();
       System.out.print("Enter the price of the book: ");
       int price = sc.nextInt();
       System.out.print("Enter the number of pages in the book: ");
       int numPages = sc.nextInt();
       sc.nextLine();
       books[i] = new Book(name,author,price,numPages);
    System.out.println("");
    for(int i = 0; i < n; i++){
       System.out.println(books[i].toString());
    System.out.println("ATHARV BORIKAR") ;
    System.out.print("1BM23IC015");
    sc.close();
  }
}
class Book{
  String name, author;
  int price, numPages;
  Book(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;
}
```

Using Abstract Class Shape

	Low Program 4
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	and an engly method named sendstead
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	absence dass thape ?
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import java.util.Scanner;

class Main{

```
public static void main(String[] args){
    Rectangle ob2 = new Rectangle();
    Triangle ob1 = new Triangle();
    Circle ob3 = new Circle();
    ob2.printArea();
    ob1.printArea();
    ob3.printArea();
    System.out.println("ATHARV BORIKAR");
    System.out.print("1BM23IC015");
  }
abstract class Shape{
  Scanner sc = new Scanner(System.in);
  int dimension1, dimension2;
  abstract void printArea();
}
class Rectangle extends Shape{
  Rectangle(){
    System.out.println("Enter the dimensions of the rectangle(Length and Breadth): ");
    dimension1 = sc.nextInt();
    dimension2 = sc.nextInt();
  }
  void printArea(){
    System.out.print("The area of the rectangle is = ");
    System.out.println(dimension1*dimension2);
  }
class Triangle extends Shape{
  Triangle(){
    System.out.println("Enter the dimensions of the triangle(base and height): ");
    dimension1 = sc.nextInt();
    dimension2 = sc.nextInt();
  }
  void printArea(){
    System.out.print("The area of the Triangle is = ");
    System.out.println(0.5*dimension1*dimension2);
  }
class Circle extends Shape{
  Circle(){
    System.out.println("Enter the dimension of the circle(radius): ");
```

```
dimension1 = sc.nextInt();

void printArea(){
    System.out.print("The area of the Circle is = ");
    System.out.println(3.1415926535897*dimension1*dimension1);
}
```

Bank Account Storage

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	protected share account trunks,
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	thus account Jupa - account Jufe;
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public roid acupul & Pepont Interest (me year) & destruct actived - borlown + Moth paw (1+ interest); balance += univers; Sultru ord quirelle ("Enterest q" + interest); display Palances (); } class Curdent extense Acount & perrote evote ance double win hat = 500; perrote evote ance double smalty = 500; genous halano) & if (anomy halano) & your and printle ("Leangeant finds"); else halance -= amount; system and printle ("Wetholeanist encessfue"); y (book (our bol) & system and printle ("Bolomo bolow minimum"); deplay Polance (); }	dans	San Acel extends descented
public roid acupul & Pepont Interest (me year) & destruct actived - borlown + Moth paw (1+ interest); balance += univers; Sultru ord quirelle ("Enterest q" + interest); display Palances (); } class Curdent extense Acount & perrote evote ance double win hat = 500; perrote evote ance double smalty = 500; genous halano) & if (anomy halano) & your and printle ("Leangeant finds"); else halance -= amount; system and printle ("Wetholeanist encessfue"); y (book (our bol) & system and printle ("Bolomo bolow minimum"); deplay Polance (); }	. 1,81	quivate states must done
public roid acupul & Pepont Interest (me year) & destruct actived - borlown + Moth paw (1+ interest); balance += univers; Sultru ord quirelle ("Enterest q" + interest); display Palances (); } class Curdent extense Acount & perrote evote ance double win hat = 500; perrote evote ance double smalty = 500; genous halano) & if (anomy halano) & your and printle ("Leangeant finds"); else halance -= amount; system and printle ("Wetholeanist encessfue"); y (book (our bol) & system and printle ("Bolomo bolow minimum"); deplay Polance (); }	3	asuge merest cate: 0.05:
System and quintle ("Lindergy of" + interest); Aiglay Balances (); Class Curter extends Account & private static sinal alabe win bat 500; persone static final alabe penalty = 50.0; Jublic void nothercural (double sources) & if (aurins) balance) & hysen and private ("Lineapoint finals"); else balance = aurount; system art private ("Withalawal successful"); y (book (min book) & hysen-art private ("Balance below minimum"); alplay Palance (); }	,	the second section
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class Cur Act extends Account & Private static sinal cludde win but = 500; Putrate static final clude win but = 500; Judic void nathalicural (double Amoust) & if (amount) halana) & kysom and private (""Insufficient finals"); else balance = amount; System and private ("No thalawal successful"); 4 (bed < num_bod) & hysom and private ("Bodona betwo numerical"); apply Bolance (); }		Extens and printles "Landonest a" + interest
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private static final clubbe war bat = 500; Jerrate static final clubbe paralty = 500; Jublic void nothercural (double sources) { if (aurono' balano) { hysen and privater ("Lumpoint finals"); else balance -= auronit; System and privater ("Withdrawal successfue"); y (bool (sun bal) { hysen and privater ("Balance below numerous"); applay Parance (); } J J		to the second of the second of the second
private static final clubbe war bat = 500; Jerrate static final clubbe paralty = 500; Jublic void nothercural (double sources) { if (aurono' balano) { hysen and privater ("Lumpoint finals"); else balance -= auronit; System and privater ("Withdrawal successfue"); y (bool (sun bal) { hysen and privater ("Balance below numerous"); applay Parance (); } J J	class	Cur Next extends Account f
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Suble void notherwood (double several) (if (aunum) balance) (hyseu ad print ln ("Luserpreint finds")) else balance == ausunt; System and print ln ("Withdrawal successful"); 4 (bod < num_bal) (hyseu ad-print ln ("Balance below nummum"); appay Balance (); }		perpate grate price double paralty = 50.0;
ystem and print la (" Insurpresent funds"); lee balance == amount; System and print la (" With that awal successful"); y (bed < num_bal) [y (bed < num	4	
ystem and print la (" Insurpresent funds"); lee balance == amount; System and print la (" With that awal successful"); y (bed < num_bal) [y (bed < num		
ystem and print la (" Insurpresent funds"); lee balance == amount; System and print la (" With that awal successful"); y (bed < num_bal) [y (bed < num	public	void nothercural (double surrus) &
else balance == ausunt; System out printly ("Withdrawal successful"); y (bod < nun-bod) [hysen out-printly ("Balance below numerical"); diplay Balance (); }		il (aurint) halano /t
balance = ausunt; System and printly ("Withdrawal successful"); 4 (bed (nun-bal) (Men and print by ("Balance televo nununum"); Apply Balance (); 3		by seem as pecialn ("Insuprement finds")
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Cumpa walled Jedated Palance & GOD. 5
Withdrawal Querenque Update Halmee \$602.5

```
Current ye gualions

Deposit successful Upolate successful $400

Current Balonce $600
```

```
import java.util.Scanner;
public class Bank {
  static Scanner sc = new Scanner(System.in);
  Account ob1;
  void createAccount() {
    String customer;
    int account;
    String type;
    int initBal;
    System.out.print("Enter the customer name: ");
    customer = sc.nextLine();
    System.out.print("Enter account Number: ");
    account = sc.nextInt();
     sc.nextLine(); // Consume the newline
    System.out.print("Enter Account type (Savings or Current): ");
    type = sc.nextLine();
    System.out.print("Enter the initial Balance: ");
    initBal = sc.nextInt();
    if (type.equals("Savings")) {
       ob1 = new Savings(customer, account, initBal);
       ob1 = new Current(customer, account, initBal);
  public static void main(String[] args) {
    Bank bank = new Bank();
    bank.createAccount();
```

```
while (true) {
       System.out.println("-----");
       System.out.println("1. Deposit 2. Withdraw");
       System.out.println("3. Compute interest");
       System.out.println("4. Display account details");
       System.out.println("5. exit ");
      int choice = sc.nextInt();
      switch (choice) {
         case 1:
           bank.ob1.deposit();
           break;
         case 2:
           bank.ob1.withdraw();
           break;
         case 3:
           if (bank.ob1 instanceof Savings) {
              ((Savings) bank.ob1).computeInterest();
            } else {
              System.out.println("Interest computation is only available for Savings accounts.");
           break;
         case 4:
           bank.ob1.display();
           break;
         case 5:
           break;
         default:
           System.out.println("Invalid choice. Please try again.");
      if(choice == 5) break;
class Account {
  String customerName;
  int accountNumber;
  int balance;
  Account(String customer, int accountNum, int bal) {
    customerName = customer;
    accountNumber = accountNum;
    balance = bal;
  void deposit() {
```

```
System.out.print("Enter the amount to deposit: ");
    int amt = Bank.sc.nextInt();
    balance += amt;
    System.out.println("Deposited: " + amt + ", New Balance: " + balance);
  void withdraw() {
     System.out.print("Enter the amount to withdraw: ");
    int amt = Bank.sc.nextInt();
    if (balance - amt < 0) {
       System.out.println("Insufficient Balance to withdraw the given amount.");
     } else {
       balance -= amt:
       System.out.println("Amount of " + amt + " withdrawn successfully. Current Balance is " +
balance);
    }
  }
  void display() {
    System.out.println("The Balance in the account is " + balance);
}
class Savings extends Account {
  double interestPercent:
  Savings(String customer, int accountNum, int bal) {
     super(customer, accountNum, bal);
    System.out.print("Enter the interest percentage on the account: ");
    interestPercent = Bank.sc.nextDouble();
  }
  void computeInterest() {
    balance += balance * (interestPercent / 100);
    System.out.println("Amount after applying interest is: " + balance);
  }
class Current extends Account {
  int minBalance = 1000;
  Current(String customer, int accountNum, int bal) {
     super(customer, accountNum, bal);
  }
  void withdraw() {
    System.out.print("Enter the amount to withdraw: ");
```

```
int amt = Bank.sc.nextInt();
    if (balance - amt < minBalance) {</pre>
       System.out.println("Insufficient Balance to maintain the minimum required.");
     } else {
       balance -= amt;
       System.out.println("Amount of " + amt + " withdrawn successfully. Current Balance is " +
balance);
     }
  }
```

<u>Program 6</u> Creating Packages CIE and SEE

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QJ	Create Poetrage CIF which has 2 classes - Poesaval & conscious. The slaw Personal has members
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	package SEE;
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	public class External cyclends Personal L public int 17 see ogasks;
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	for (uid 0=0; i <n; i++)="" td="" {<=""></n;>
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	gysell out frather ("Student" + (i+1) + ":"); sysell out paneler ("USN:" + students [i] non) horem - Out pantler ("Nouve:" + students [i] name
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	System out print (picel llage);
4	The same of the sa
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```
Output

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Color details for sucher's 1

USN 123

Name Jan Doc

Suestor 5

Onter Internal marks:

30 90 70 85 95

Final Marks of Students:

Suester: John Doc

Timal marks: Course wise

55 63 55 61 54
```

```
package CIE;
```

import java.util.Scanner;

public class Student {
 protected String usn;
 protected String name;

```
protected int sem;

// Method to input student details
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();
  }
  // Method to display student details
  public void displayStudentDetails() {
    System.out.println("USN: " + usn);
     System.out.println("Name: " + name);
    System.out.println("Semester: " + sem);
  }
}
package CIE;
import java.util.Scanner;
public class Internals extends Student {
  protected int[] marks = new int[5];
  // Method to input internal marks
  public void inputCIEmarks() {
     Scanner s = new Scanner(System.in);
     System.out.println("Enter internal marks for 5 subjects:");
     for (int i = 0; i < 5; i++) {
       System.out.print("Enter marks for subject " + (i + 1) + ": ");
       marks[i] = s.nextInt();
  }
package SEE;
import CIE.Internals;
import java.util.Scanner;
public class Externals extends Internals {
  protected int[] marks = new int[5];
                                         // SEE marks
  protected int[] finalMarks = new int[5]; // Final marks
  // Constructor to initialize the marks arrays
  public Externals() {
     marks = new int[5];
     finalMarks = new int[5];
  }
```

```
// Method to input SEE marks
  public void inputSEEmarks() {
    Scanner s = new Scanner(System.in);
    System.out.println("Enter SEE marks for 5 subjects:");
    for (int i = 0; i < 5; i++) {
       System.out.print("Enter SEE marks for subject " + (i + 1) + ": ");
       marks[i] = s.nextInt();
  }
  // Method to calculate final marks (internal + external)
  public void calculateFinalMarks() {
     for (int i = 0; i < 5; i++) {
       finalMarks[i] = marks[i] + this.marks[i]; // Final marks = internal + external
  }
  // Method to display final marks
  public void displayFinalMarks() {
    displayStudentDetails(); // Display student details (inherited from Student)
    System.out.println("Final Marks:");
    for (int i = 0; i < 5; i++) {
       System.out.println("Subject " + (i + 1) + ": " + finalMarks[i]);
  }
import SEE.Externals;
import java.util.Scanner;
class Main {
  public static void main(String args[]) {
    Scanner s = new Scanner(System.in);
    // Input number of students
    System.out.print("Enter number of students: ");
    int n = s.nextInt();
    s.nextLine(); // Consume newline
    Externals[] students = new Externals[n];
    // Input details for each student
    for (int i = 0; i < n; i++) {
       students[i] = new Externals();
       System.out.println("\nEnter details for student " + (i + 1) + ":");
```

```
students[i].inputStudentDetails();
students[i].inputSEEmarks();
students[i].calculateFinalMarks();
}

// Display final marks for each student
System.out.println("\nDisplaying final marks for all students:");
for (int i = 0; i < n; i++) {
    students[i].displayFinalMarks();
}

s.close();
}</pre>
```

Handling Exceptions in Inheritance Tree

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public static void man (8144 17 cage) ?
   catch ( whong Exception a)
      Scanner close ()
Oregut
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```

```
import java.util.Scanner;

class WrongAge extends Exception {
   public WrongAge() {
      super("Age Error");
   }

public WrongAge(String message) {
```

```
super(message);
  }
}
class InputScanner {
  Scanner s = new Scanner(System.in);
}
class Father extends InputScanner {
  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 {
  int sonAge;
  public Son() throws WrongAge {
    super();
    System.out.print("Enter Son's age: ");
     sonAge = s.nextInt();
    if (sonAge >= fatherAge) 
       throw new WrongAge("Son's age cannot be greater than or equal to father's age");
     } else if (sonAge < 0) {
       throw new WrongAge("Age cannot be negative");
  }
  public void display() {
    System.out.println("Son's age: " + sonAge);
    super.display(); // This calls the Father's display method
  }
}
```

```
public class Exception_Handling{
   public static void main(String[] args) {
      try {
            System.out.println("ATHARV BORIKAR 1BM23IC015");
            Son son = new Son();
            son.display();
        } catch (WrongAge e) {
                System.out.println("Exception: " + e.getMessage());
        }
    }
}
```

Threads Creation

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	one thread degelaying "Brog Costee on Quint
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Depositioned Harear depositions Thread - new Dept None

Collectioned Harear collections

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```

```
Thread.sleep(2000);

}
} catch (InterruptedException e) {
    System.out.println(e);
}

public static void main(String[] args) {
    BMSDisplayThread bmsThread = new BMSDisplayThread();
    CSEDisplayThread cseThread = new CSEDisplayThread();
    System.out.println("ATHARV BORIKAR");
    System.out.println("1BM23IC015");
    bmsThread.start();
    cseThread.start();
}
```

User Interface Creation

```
Rab Program 9
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```

```
import javax.swing.*;
import java.awt.*;
import java.awt.event.*;

class SwingDemo {
    SwingDemo() {
        JFrame jfrm = new JFrame("Divider App");
        jfrm.setSize(275, 200);
    }
}
```

```
jfrm.setLayout(new FlowLayout());
jfrm.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
JLabel ilab = new JLabel("Enter the divisor and dividend:");
JTextField aitf = new JTextField(8);
JTextField bitf = new JTextField(8);
JButton button = new JButton("Calculate");
JLabel err = new JLabel();
JLabel alab = new JLabel();
JLabel blab = new JLabel();
JLabel anslab = new JLabel();
ifrm.add(err);
jfrm.add(jlab);
jfrm.add(ajtf);
jfrm.add(bjtf);
jfrm.add(button);
jfrm.add(alab);
ifrm.add(blab);
jfrm.add(anslab);
button.addActionListener(new ActionListener() {
  public void actionPerformed(ActionEvent evt) {
     try {
       int a = Integer.parseInt(ajtf.getText());
       int b = Integer.parseInt(bjtf.getText());
       int ans = a / b;
       alab.setText("A = " + a);
       blab.setText("B = " + b);
       anslab.setText("Ans = " + ans);
       err.setText("");
     } catch (NumberFormatException e) {
       alab.setText("");
       blab.setText("");
       anslab.setText("");
       err.setText("Enter Only Integers!");
     } catch (ArithmeticException e) {
       alab.setText("");
       blab.setText("");
       anslab.setText("");
       err.setText("B should be NON zero!");
```

```
});
    ifrm.setVisible(true);
  public static void main(String args[]) {
    SwingUtilities.invokeLater(new Runnable() {
       public void run() {
         new SwingDemo();
    });
} import javax.swing.*;
import java.awt.*;
import java.awt.event.*;
class SwingDemo {
  SwingDemo() {
    JFrame jfrm = new JFrame("Divider App");
    jfrm.setSize(275, 200);
    jfrm.setLayout(new FlowLayout());
    jfrm.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
    JLabel jlab = new JLabel("Enter the divisor and dividend:");
    JTextField aitf = new JTextField(8);
    JTextField bjtf = new JTextField(8);
    JButton button = new JButton("Calculate");
    JLabel err = new JLabel();
    JLabel alab = new JLabel();
    JLabel blab = new JLabel();
    JLabel anslab = new JLabel();
    jfrm.add(err);
    ifrm.add(jlab);
    jfrm.add(ajtf);
    jfrm.add(bjtf);
    jfrm.add(button);
    jfrm.add(alab);
    jfrm.add(blab);
    ifrm.add(anslab);
```

```
button.addActionListener(new ActionListener() {
     public void actionPerformed(ActionEvent evt) {
       try {
          int a = Integer.parseInt(ajtf.getText());
          int b = Integer.parseInt(bjtf.getText());
          int ans = a / b;
          alab.setText("A = " + a);
          blab.setText("B = " + b);
          anslab.setText("Ans = " + ans);
          err.setText("");
        } catch (NumberFormatException e) {
          alab.setText("");
          blab.setText("");
          anslab.setText("");
          err.setText("Enter Only Integers!");
        } catch (ArithmeticException e) {
          alab.setText("");
          blab.setText("");
          anslab.setText("");
          err.setText("B should be NON zero!");
       }
     }
  });
  jfrm.setVisible(true);
public static void main(String args[]) {
  SwingUtilities.invokeLater(new Runnable() {
     public void run() {
       new SwingDemo();
  });
}
```

Program 10 a)

Demonstrating IPC

	() Vole ()
	Page
1	0. 0
1	Lato Program 10
1 0	
	J Demonstrale Indu Process Communication & Deposition
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	while (i= 15) &
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	dan Consumer implemente Enmake E
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	in 4 = 9.800;
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	3
	3

Output:
put 1
fut 2
Put 3
90t : 3 Put : 4
Got :4 Put :5
got:5

```
class Q {
 int n;
 boolean valueSet = false;
 synchronized int get() {
    while(!valueSet)
      try {
         System.out.println("\nConsumer waiting\n");
         wait();
       } catch(InterruptedException e) {
         System.out.println("InterruptedException caught");
    System.out.println("Got: " + n);
    valueSet = false;
    System.out.println("\nIntimate Producer\n");
    notify();
    return n;
  }
 synchronized void put(int n) {
    while(valueSet)
      try {
         System.out.println("\nProducer waiting\n");
```

```
wait();
       } catch(InterruptedException e) {
         System.out.println("InterruptedException caught");
    this.n = n;
    valueSet = true;
    System.out.println("Put: " + n);
    System.out.println("\nIntimate Consumer\n");
    notify();
  }
class Producer implements Runnable {
  Qq;
  Producer(Q q) {
    this.q = q;
    new Thread(this, "Producer").start();
  public void run() {
    int i = 0;
    while(i < 15) {
       q.put(i++);
class Consumer implements Runnable {
  Qq;
  Consumer(Q q) {
    this.q = q;
    new Thread(this, "Consumer").start();
  public void run() {
    int i=0;
    while(i<15) {
       int r=q.get();
       System.out.println("consumed:"+r);
       i++;
class IPC {
  public static void main(String args[]) {
    Q q = new Q();
    System.out.println("ATHARV BORIKAR 1BM23IC015");
    new Producer(q);
    new Consumer(q);
```

```
System.out.println("Press Control-C to stop.");
}
Program 10 b)
Demonstrating Deadlock
Algorithm:
Code:
import java.util.*;
class A {
  synchronized void foo(B b) {
    String name = Thread.currentThread().getName();
    System.out.println(name + " entered == A.foo");
    try {
       Thread.sleep(1000);
     } catch (Exception e) {
       System.out.println("A Interrupted");
    System.out.println(name + " trying to call B.last");
    b.last();
  }
  synchronized void last() {
    System.out.println("Inside A.last");
}
class B {
  synchronized void bar(A a) {
    String name = Thread.currentThread().getName();
    System.out.println(name + " entered B.bar");
    try {
       Thread.sleep(1000);
     } catch (Exception e) {
```

```
System.out.println("B Interrupted");
    System.out.println(name + " trying to call A.last");
    a.last();
  }
  synchronized void last() {
    System.out.println("Inside B.last");
}
class Deadlock implements Runnable {
  A a = new A();
  B b = new B();
  Deadlock() {
    Thread.currentThread().setName("MainThread");
    Thread t = new Thread(this, "RacingThread");
    t.start();
    a.foo(b);
    System.out.println("Back in main thread");
  }
  public void run() {
    b.bar(a);
    System.out.println("Back in other thread");
  public static void main(String args[]) {
    new Deadlock();
  }
}
```