VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.



LAB REPORT

on

OBJECT ORIENTED JAVA PROGRAMMING

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" carried out by SANCHIT KASHYAP (1BM23CS298), 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 2024-25. The Lab report has been approved as it satisfies the academic requirements in respect of Object-Oriented Java Programming Lab - (23CS3PCOOJ) work prescribed for the said degree.

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

```
import java.util.Scanner; public
class LabProgram1 {
   public static void main(String[] args) {
       Scanner sc = new Scanner(System.in);
       System.out.println("Enter the coefficients of quadratic equation:");
      int a = sc.nextInt();
      int b = sc.nextInt(); int c =
       sc.nextInt(); double r1, r2;
      if(a == 0){
          System.out.println("Please enter valid value"); return;
       else{
          int d = b * b - 4 * a * c; if (d > 0){
              System.out.println("Real and Distinct roots."); r1 =
              (-b + Math.sqrt(d)) / (2
              * a);
              r2 = (-b - Math.sqrt(d)) / (2 * a); System.out.println("Roots
              are: " + r1 + " and " + r2);
          else if(d < 0){
```

```
System.out.println("Imaginary roots."); d

= Math.abs(d);

r1 = (-b + Math.pow(d, 0.5)) / (2 * a);

r2 = (-b - Math.pow(d, 0.5)) / (2 * a); System.out.println("Roots are: " + r1 + " and "

+ r2);

}
else{

System.out.println("Real and Equal roots."); r1 = r2

= (-b) / (2 * a);

System.out.println("Roots are: " + r1 + " and "

+ r2);

}
}
}
```

```
Enter the coefficients of a,b,c

1 2 3

Roots are imaginary

Root1 = -1.0 + i1.4142135623730951

Root1 = -1.0 - i1.4142135623730951

Process finished with exit code 0
```

```
"C:\Program Files\Java\jdk-23\bin\
Enter the coefficients of a,b,c
2 3 1
Roots are real and distinct
Roo1 = -0.5 Root2 = -1.0

Process finished with exit code 0
```

PAGE: DATE: LAB PROGRAM-1 Develop a jour program that prints all real lol to a quadritic eq " a " + bat c = 0. Read a, b, c and use quadritic formula. If discuminant b2- you is regative display there are no real closs and { Public Static void moines 5 System out printles ("Entera, b, c"); b = in next mote; (= in. next Into; (a==0) { System out grindles (" Enter volid volue"); doubled = 6*6 - 7*a *C if (d>0) & - 1000 PP884. System out fruth (" Peol and dytinet root!");

Soble 2, = (-b + Math synta) / (2*a);

Soulle 2 = (-b - Math synt(d)) / 2*a; System out printles ("Footland" + r, + "and" + r2)

DATE: Enter coefficients of quadritic equation Imaginary groats. Enter coefficients of quadritic equation Real and distinct brooks. Enter the coefficients of quodestic equation Real and Equal roots 'Roals are'. - 21.0 and - 1.0

LABORATORY 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.

```
class Student{
   String usn,
   name; int∏
   marks; int[]
   credits:
   void get(){
       Scanner sc = new Scanner(System.in);
       System.out.println("Enter the usn of student: ");
       usn = sc.next(); System.out.println("Enter the
       name of student: "); name = sc.next();
       System.out.println("Enter number of
       subjects: "); int n = sc.nextInt(); marks =
       new
       int[n]; credits = new
       int[n];
       for(int i=0; i<marks.length; i++){ System.out.println("Enter the
           credits of 3 subjects: "); credits[i] = sc.nextInt();
           System.out.println("Enter the marks of 3 subjects: ");
           marks[i] = sc.nextInt();
   void display(){ System.out.println("Display details
       of Student: "); System.out.println("USN: " +
       usn); System.out.println("Name: "
       + name);
       System.out.println("Marks scored in various
```

```
subjects along with credits are: "); for(int i=0;
       i<marks.length; i++){</pre>
            System.out.println(marks[i] + " " + credits[i]);
   }
   double calcSGPA(){
        double sgpa = 0,
       totalCredits = 0; for(int i=0;
       i<marks.length; i++){</pre>
            sgpa += (marks[i] / 10) * credits[i];
            totalCredits += credits[i];
       return sgpa / totalCredits;
public class Lab { public
   static void
        main(String[] args) { Student s1 =
       new Student(); s1.get();
         s1.display();
        System.out.println(s1.calcS
        GPA());
   }
```

```
Enter the usn of student:
1BM23CS304
Enter the name of student:
Sarim
Enter number of subjects :
Enter the credits:
Enter the marks:
Enter the credits:
Enter the marks:
Enter the credits:
Enter the marks:
Display details of Student:
USN: 1BM23CS304
Name: Sarim
Marks scored in various subjects along with credits are:
70 2
80 3
90 4
8.22222222222221
```

Develop a jour program to create a clossessature with members own, nome on array credite and in array credite and diplay details and method to concept and of a student. import jone util *; close student & String ush, nome; jut [] marks; Void get () {
Scorner in = new Sconner (Syllem-in);
System-out pointly ("Enter nome, use out
no of subject");

un = in - next mot (); name - in westlines; num = in next hotes; Credits = new 200 int [num]; marks = new jut [hum]; for (int i = 0; i < rum; itt) {

Syllin out pointly ("Enter credits for rulged"+

(i+1) + ":"); (sudity[i] = in-next 9mt(); System aux printles (a Enter marks for subject + (i+1) marks [i] = in- next Int ();

vid liplage System out familia ("USN: " + ven!;
System out familia (" nome: "+ vine) for (int)=0; is Credity length; [++), {
System out partitul "Subject" + (1+01)+
"1-credit!" + Credits [i] + "Morbs" + world [i]); double tale SGPA() { double lapa = 0; int total Credity = 0; for (inti=0; ix viells length; i++ Super = (modeli) (10) * crescu[i] Litel credit = credit [1]; February Sapra Statal Credits, Glass Student SG. PA. § fully Mate Void main() } Student 3 = new Studently; Sact (1) & duployer; System our gowith (" Soft: "+

DATE PAGE * PROGRAM 2 0/P = Enter the use of student

1BM 23CS 298

Enter the name of student

South the number of sulgests Enter credity Enter credits Enge the works Ender the credity Enter marks! Enteroredts Finle marks 90 None: Sanchit Capa: 8.230769

LABORATORY 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.

```
import java.util.*;
class Book{ String
   name, author;
   float price;
   int num pages;
   Book(String name, String author, float price, int num pages){
       this.name = name;
       this.author = author;
       this.price = price;
       this.num_pages =
       num pages;
   public void setDetails(){
       Scanner sc = new Scanner(System.in);
       System.out.println("Enter the name of the book: ");
       name = sc.next(); System.out.println("Enter the
       name of the author: "); author = sc.next();
       System.out.println("Enter the price of the book: ");
       price = sc.nextFloat(); System.out.println("Enter the
       num of pages: "); numOfPages = sc.nextInt();
   public void getDetails(){
       System.out.println("Name of the book: " + name);
       System.out.println("Name of the author: " + author);
       System.out.println("Price of the book: "
       + price); System.out.println("Number of pages: "
```

```
+ num_pages);
     }
     public String toString(){
         return "Book Name: " + name + " Author Name: " + author + "
 Price: " + price + " Number Of Pages: " + num_pages;
 public class Lab { public
     static void
         main(String[] args) { Scanner sc
         = new Scanner(System.in);
         System.out.println("Enter the number of
         books: "); int n = sc.nextInt(); Book[] books =
         new Book[n];
         for(int i=0; i<n; i++){ books[i].setDetails();</pre>
             books[i].getDetails();
         }
for(int i=0; i<n; i++){ System.out.println(books[i].toString());</pre>
}
```

Enter the number of books: Enter the name of the book: 1984 Enter the name of the author: Anthony Enter the price of the book: 400 Enter the num of pages: 200 Enter the name of the book: MockingBird Enter the name of the author: Harper Enter the price of the book: Enter the num of pages: 150 Name of the book: 1984 Name of the author: Anthony Price of the book: 400.0 Number of pages: 200 Name of the book: MockingBird Name of the author: Harper Price of the book: 500.0

Number of pages: 150

reate a class Book which contoins four members = name, author, price, nun-Pogls, Include a Constructor to set the volues fee men Include methods to set and get details of the colject. Included to slowing (method that could display the complete actory of the look. Class Book Sterny name, outlier, double price, int rum - Poges, Book (Etring nome; String author, float price, int num this author = author; this price = price; this num poges - num pages, public veil set Detoils () { Sconmerta in > new Sconner (System in) System out println (" Einter all details"). author - in reality. name = in next mty, Price z in next Float (). numoffagy - in next not g; Public voil get Details () } System. out printly " Name of look + home !-System. out peintln (some of souther " + outha System out println(Nome of look "+ price!

System out printle ("Number of page" town forge Public String to String () reduem " Book norme": " + name + "Author name," + outhor + "Price+" price + "Number of Page! public (loss fol & public state void moin () Scorner in = new Scarner Czyltem in System out prindle (" Enter no of books inth = in not mit Book [] looks - nem Book [h]; for (inti=0, ikn, 1++).} 3 book LIJ - Set Petrily (); for (inti=ojikn; 144) Sooh [i] get Details (s;

LABORATORY 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

```
abstract class
 Shape{ int x,
 у;
 Shape(int x,
   int y){
   this.x
   = x;
   this.y =
   у;
 void printArea(){}
}
             Rectangle
class
                Shape{
 extends
 Rectangle(int length,
 int breadth){
   super(length, breadth);
 }
 void
   printArea(){
   int area = x
   * y;
   System.out.println("Area of Rectangele = " + area);
```

}			

```
super(radius, 0);
 void printArea(){
   double area = Math.PI * x * x;
   System.out.println("Area of Circle = "
   + area);
 }
public class LP4 {
 public
              static
                         void
   main(String[]
                    args) {
   Rectangle
                         new
   Rectangle(10,
   5); r.printArea();
   Triangle t = new
   Triangle(6, 8);
   t.printArea();
   Circle c = new Circle(7);
   c.printArea();
}
```

```
Area of Rectangele = 50
Area of Triangle = 24.0
Area of Circle = 153.93804002589985
```

PAGE: Develop a Jona program to create on obstract class vamed shope that contains I integers and empty method point print prea is. Provide that classes mained rectorgle, triangle and circle such that each of theil extends the class shope. Colculate area for lock shope abstract class shape & closs Pectangle extends shape ? Rectorgle (intelength, int breadth) this u = length; this ge = breadth gerongle (int bost) int height)

this: n = bost;

this: g = height;

Void Print Area () 9
System out pointly ("Area of zerougle" farea) class circle extends Shape & Circle (jut drapius) 3 ths 4 - Iradius; void Print Area () { Louble area - Moth PI & goding & roding; System out printh ("Area of web!" + area) Class Main & pulle state void main (string [] org) Shape in - new Rectorgle 10,5%; Shope t = new grangle (6,8); Shope (= pen (irile (7); 9. printArea(); A. PrintAreaci C- print Area () Output: A Irla of rectongle: 50

Area of triangle: 24-00

Area of circle: 153:9380

LABORATORY 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. 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.

```
import java.util.Scanner;
class Account {
 String customerName, accountNumber,
 accountType; double balance;
 public Account(String name, String accNo, String
   type, double bal) { customerName = name;
   accountNumber =
   accNo; accountType
   = type; balance =
   bal;
 }
 public void deposit(double
   amt) { if (amt < 0) }
    System.out.println("Deposit amount must be positive.");
   }
   balance += amt;
   System.out.println("Deposit successful. Updated balance: " + balance);
```

```
public void displayBalance(){
    System.out.println("Current Account Balance: " + balance);
}

class SavAcct extends Account {
    static final double interestRate = 0.05;

public SavAcct(String name, String
    accNo, double bal) { super(name,
    accNo, "Savings", bal);
```

```
}
 public void calcInterest(int years) {
   double interest = balance * Math.pow(1 +
   interestRate, years) - balance; balance += interest;
   System.out.println("Interest of " + interest + " deposited. Updated balance: " +
   balance);
 }
 public void
   withdraw(double amt) {
   if(amt <= balance) {</pre>
     balance -= amt;
    System.out.println("Withdrawal successful. Updated balance: " + balance);
   }
   else {
    System.out.println("Insufficient balance.");
   }
 }
class CurAcct extends Account {
 static final double minBalance =
 10000; static final double
 penaltyCharge = 50;
 public CurAcct(String name, String
   accNo, double bal) { super(name,
   accNo, "Current", bal);
 }
```

}

```
public void
  withdraw(double amount)
  { if(amount <= balance) {
    balance -= amount;
    System.out.println("Withdrawal successful. Updated balance: " + balance);</pre>
```

```
if(balance <
      minBalance) { balance
      -= penaltyCharge;
      System.out.println("Balance below minimum. Service charge of
" + penaltyCharge + " imposed");
      System.out.println("Updated balance: " + balance);
    }
   }
   else {
    System.out.println("Insufficient balance.");
   }
public class Bank {
 public static void main(String[]
   args) { Scanner sc = new
   Scanner(System.in);
   SavAcct
                 \mathbf{s}\mathbf{A}
                          =
                                  new
   SavAcct("ABC", "SA123", 1000);
   CurAcct
                 cA
   CurAcct("XYZ", "CA456", 600);
   sA.deposit(200);
   sA.calcInterest(2
   );
   sA.withdraw(500
   );
```

sA.displayBalan

```
ce();

cA.deposit(300)
;

cA.withdraw(7
0 0);

cA.displayBalan
ce();
}
```

```
Deposit successful. Updated balance: 1200.0
Interest of 123.0 deposited. Updated balance: 1323.0
Withdrawal successful. Updated balance: 823.0
Current Account Balance: 823.0
Deposit successful. Updated balance: 900.0
Withdrawal successful. Updated balance: 200.0
Balance below minimum. Service charge of 50.0 imposed
Updated balance: 150.0
Current Account Balance: 150.0
```

(5) WAP to orall class Bonh Mat inginding sens through of account for its automers, one colled sowings occount for its automars, one colled sowings occount and allow colled current occount house facility but no interest current occount holders should also maintain into lational. Do My following talk.

Accept deposit from customers and explose bolame (b) deplay before.

(a) Permit and deposit interest

(a) Permit withdrawl and update the bolance

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Class Account **

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occount type; double bolane;

public Account (String nome, String ou No string dybe, double bol) ? cueloma Novo - nome, ougust Munky = outo; Dolovie = Doly public void defrosit (double aunt) ?

if (ount <0) {

Sophis (" Defrount must be possible ");

erelium; 3

polomet = ount; Sofela ("Dep Sweelful. "plated balance!" + balone Sofila ("Current occount bal!" + balone) Class Sov Acct letendy Account & static final double juterest Rate = 0.05 pully Soy Acct (String norme, String AccNo double bol)
Super (nome, out o, "Sowings ", bol) Pully Void coly Interest (jut years) {

Double interest = bolome * Moth pour (1+

interest Pade, years) - bolomer;

Dolyme + = interest;

Sofula ("Interest)

Sofula ("Interest of" + Anterest interest + "

defroited . Up loted bolome: " + bolome); Public void withdraw (double out if (ant <= bolome) {

DATE System out growth [" Weight melweight, Updated MGE System out fruther (" herfficient b Class Cur ACU ledende Account ?

Malie Ginel double minibalano = 10000;

Static Givel double penply charg = 50, Public Currect (string name, string our of double tol) ?
Super (name, our No , "current", bol), 3 Pully Void cultiform (Soulle amount Sofila (balance); Pulls state void main (string [) wig Synthes &c = new Scannes (System 1/1)

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SA · Cole Interest (2);

SA · Cole Interest (2);

SA · Cole Interest (2);

SA · Cole Interest (2);

SA · Cole Interest (2);

CA · Cole Interest (2 @ Output Enter mamber of studenty?

1 KM2 31 245 Defrosit sweelful updoled bolome: 1700.0 Inderest of 123 o deposities updoled cholone: 13238 underland sweelful updoled bolome: 833.0 Current Ace Colonel: 823-0 Defrait successful. Up detylpland: 900
mishplynd wicesful. Updated bolomo. 9 25-0
Bolome lalour munimum survice sharped 50.0
awrend bolome. 150

LABORATORY PROGRAM – 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.

```
// Internals.java
package CIE;
public class Internals{
 public int[] marksInternal = new
 int[5]; public void set(int[]
 marks){
   for(int i=0;
     i<marks.length; i++){
     marksInternal[i] =
     marks[i];
 public int[] get(){
   return
   marksInternal;
 }
}
// Suudent.java
package CIE;
```

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

```
//
Externals.java
package SEE;
import
CIE.Student;
public class Externals
 extends Student{ public
 int[] marksSEE = new
 int[5];
 public Externals(String usn, String
   name, int sem){ super(usn, name,
   sem);
 public void set(int[]
   marks){ for(int i=0;
   i<marks.length; i++){
     marksSEE[i] = marks[i];
   }
 }
 public int[]
   get(){ return
   marksSEE;
 }
}
```

```
import
CIE.*;
import
SEE.*;
import java.util.Scanner;

public class LP6 {
  public static void main(String[]
    args) { Scanner sc = new
        Scanner(System.in); int n;
        System.out.println("Enter the number
        of students: "); n = sc.nextInt();
```

```
Student[] studs = new
Student[n]; Internals[]
internals = new Internals[n];
Externals[] externals = new
Internals[n];
for(int i=0; i<n; i++){
 System.out.println("Enter
 the USN: "); String usn =
 sc.next();
 System.out.println("Enter
 name: "); String name =
 sc.next();
 System.out.println("Enter
 the sem: "); int sem =
 sc.nextInt();
 studs[i] = new Student(usn, name,
 sem); internals[i] = new Internals();
 externals[i] = new Externals(usn, name, sem);
 System.out.println("Enter marks of
 internals: "); int[] marksInt = new
 int[5];
 for(int j=0; j<5; j++){
   marksInt[j] =
   sc.nextInt();
```

```
internals[i].set(marksInt);

System.out.println("Enter marks
  of see: "); int[] marksSee = new
  int[5];

for(int j=0; j<5; j++){
    marksSee[j] =
    sc.nextInt();
}
externals[i].set(marksSee);
}</pre>
```

```
for(int i=0; i<n; i++){
 System.out.println("USN: "
 + studs[i].usn);
 System.out.println("Name: " + studs[i].name);
 int[] totalMarks = new
 int[5]; int[] marksInt
 = internals[i].get();
 int[] marksSee = externals[i].get();
 for(int j=0; j<5; j++){
   totalMarks[j] = marksInt[j] + marksSee[j]/2;
   System.out.println(totalMarks[j]);
 }
```

DATE: PAGE: I'm course of the curs the student create suthas which the class External while SEE when student. The close has on array that Story the SEE marks sioned in 5 courses of the current remester of the student I what the 2 Pochogy in a file that declary the final marks of n students in all 5 of courses. CIE/Students jona. Pochoge CIE ; public class student Public String ush;

Public String ush;

Public Strong ush;

Public Stodent (String vsn, string name, jut thy. sem = sem

DATE CIE/ guternal joura pochoge (TE)

public closs internal &

public int [] morty Internal = new hot [5]

public void let (in [] mortes) for (int i = 0; i < marks. length it)
marks Internal [i] = marks [i]; public int [] get () { return marks ndernol SEE / Externaly jour Porhoad SEE; public closs Externally extends student {
 public int [] marks SE E = new Int [5];
 public Externals (Stering Ven, String nome,
 int sem) { super (usu, name, sem); for (int i = 0; i < marks. length; i++
works SEE [i] = works [i];

PAGE: fuller just I get () & get () & LP6 jana import SEE - of ; import song - util . Sconnes; Public class LPG { Public static void main () } Scorner & = new Sconner (Syllen in); System out println(" ontes the number of N= go next hot (), student [] study = new Student En]; Internal [] internal = new meernof[h], External [] external = new External for (int i=0, ich, itt)
sofila (a trate detaile"), Spring ven = +to ec next () (tring name = So next(); in dem = se next mt(); studs [i] = new Student (ush, nome, sem internaly [i] = new Internaly (); externals [1] = new Externals (Usin, nome,

PAGE PHOE Tysten out family ("tales works of judices to mark of mark out - new but 65.) Output : for (in) = e (5) itt) & marky 9nt (1) = se newhors; Enter purples of etulant: 3 Ender the USK: 28M 23C5 298 internals till set (marke But); sofila (" Finter SEE morks") Enter mome! Sandit IN [] wards SEE = New Sux [5], Comeller for (int j=0, j < 5, j++) & need holds, 13 Enter Indernal marks for 5 courses 18 20 15 17 19 Ender marke of SEF "externaly Eil set (marks SEE) 70 80 75 60 90 for (int i=0 iz n; i+1) {
Sofula ("VSN"+ Study [i] usn);
Sofula ("Nome" + Study [i] Nome); USN: 1BM23C5298 Name: Somehit 53 in [] total Marks = new Snelly , int [] marks SEE = externals [1] got(); for (INT) = (5) itt) {
total Marks (j) = marks m (j) +
marks SEE (j) /2;
Sophin (votal Marks (j)); 74

LABORATORY 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=father's age.

```
class WrongAge extends
   Exception { String
   message;
   WrongAge(String
       message) {
       this.message =
       message;
   public String toString() {
       return "WrongAge Exception: " + message;
class Father
   { int fAge;
   Father(int age) throws
       WrongAge { if (age < 0) {
          throw new WrongAge("Father's age cannot be negative!");
       fAge = age;
class Son extends Father
   { int sAge;
   Son(int fAge, int sAge) throws
       WrongAge { super(fAge);
```

```
if (sAge < 0) {
            throw new WrongAge("Son's age cannot be negative!");
        if (sAge >= fAge) {
            throw new WrongAge("Son's age cannot be greater than
or equal to Father's age!");
        this.sAge = sAge;
public class LP7 { public
    static void
        main(String[] args) { try { Father
            father1 = new Father(40);
            Son son1 = new Son(40, 20);
            System.out.println("Father's age: " + father1.fAge
+ ", Son's age: " + son1.sAge);
          Father father2 = new Father(-5);
      catch (WrongAge e) {
          System.out.println(e);
      try {
          Son son2 = new Son(35, 40);
      catch (WrongAge e) { System.out.println(e);
      try {
          Son son3 = new Son(50, -10);
      catch (WrongAge e) { System.out.println(e);
```

Father's age: 40, Son's age: 20 WrongAge Exception: Father's age cannot be negative! WrongAge Exception: Son's age cannot be greater than or equal to Father's age! WrongAge Exception: Son's age cannot be negative!

PAGE: DATE: LAB-PROGRAM-7 NAP that demonstroly handling of exceptions in interitance drue. Create a love class called Father" and derived class son which extends the hase class. In pathes class implement a Constructor which takes the age and through the leception . Wrong Age of when the right age < 0. class Wrong Agy extends Exception & Moony Age (String ong)

this mig = mig; Publy String to String () {
 repure y wrong Age exception: "I mag; Clos Father } Father (int og) throws Ulrong Age (" Fathers oge con't be negative");

LABORATORY 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.

```
class Threads extends
 Thread{ String s; int
 time; Threads(String
 s, int time){
   this.s = s;
   this.time =
   time;
 public void
   run(){ try{
     while(true){
      System.out.println(s)
      ; Thread.sleep(time
      * 1000);
     }
   catch(InterruptedException ie){
     System.out.println("Thread occurs:
     **
     + ie);
public class LP8{
 public static void main(String[] args) {
```

Threads t1 = new Threads("BMS College of

```
Engineering", 10); Threads t2 = new
Threads("CSE", 2);

t1.start();
   t2.start();
}
```

LABORATORY PROGRAM - 9

Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a NumberFormatException. If Num2 were Zero, the program would throw an Arithmetic Exception Display the exception in a message dialog box.

```
import
java.awt.*;
import
java.awt.event.*;
public class DivisionMain1 extends Frame implements ActionListener
     TextField
     num1,num2;
     Button
     dResult; Label
     outResult;
     String
     out="";
     double
     resultNum
     ; int
     flag=0;
     public DivisionMain1()
           setLayout(new FlowLayout());
           dResult = new Button("RESULT");
           Label number1 = new Label("Number
           1:",Label.RIGHT); Label number2 = new
           Label("Number
                                2:",Label.RIGHT);
           num1=new TextField(5);
           num2=new TextField(5);
           outResult = new Label("Result:",Label.RIGHT);
```

```
add(number1
     );
     add(num1);
     add(number2
     );
     add(num2);
     add(dResult);
     add(outResul
     t);
     num1.addActionListener(this);
     num2.addActionListener(this);
     dResult.addActionListener(this)
     ; addWindowListener(new
     WindowAdapter()
           public void windowClosing(WindowEvent we)
                                         System.exit(0);
                                     }
                  });
public void actionPerformed(ActionEvent ae)
     int
     n1,n2;
     try
      {
           if (ae.getSource() == dResult)
                 n1=Integer.parseInt(num1.getText());
                 n2=Integer.parseInt(num2.getText());
                 /*if(n2==0)
                       throw new
                 ArithmeticException();*/
                 out=n1+" "+n2+" ";
                 resultNum=n1/n2;
                 out+=String.valueOf(result
```

```
}
      }
     catch(NumberFormatException e1)
      {
           flag=1;
           out="Number Format Exception!
           "+e1; repaint();
      }
      catch(ArithmeticException e2)
           flag=1;
           out="Divide by 0 Exception!
            "+e2; repaint();
      }
public void paint(Graphics g)
     if(flag==0)
     g.drawString(out,outResult.getX()+outResult.getWidth(),outRes
      ult.getY()+outResult.getHeight()-8);
      else
     g.drawString(out,10
     0,200); flag=0;
public static void main(String[] args)
      DivisionMain1 dm=new
     DivisionMain1(); dm.setSize(new
     Dimension(800,400));
      dm.setTitle("DivisionOfIntegers");
      dm.setVisible(true);
```

}

Num); repaint();

24-12-2024 Late-Program -9 Jose a program creates a few interface to perform integel dissons. uses enters two numbers in the text fields, Nums, and Num? The sold button is clicked of Num! or Num? were not an integer, the roogeam would throw an perfueticoception desplay the port jours aut. x; port gova aut went . *; ubile class DivisionMain L entends Frame implements Actionsistenes? Text Field nums, num? Button dResult; Label outResult; String out = " " double result Num; int flag = 0: public DISION Mains () { settayout (new Flow tayout ()); dresult = new Button ("RESULT"); Label numbers = new Labell Number J: ", Label RIGHT); dabel wumber 2 = new Label ("Number 2: ", Loubel-RIGHT); num! = new Tent Field (5); numa = new TextField(5); outresult = new datel("Result:", Latel-RICHT); add (number 1); add (niems); add (numbel 2); add (num2); add (dRisult); add (outresult); nums. add Action Listener (+lies); numz. add Action Listener (Hus); dResult. add Action Vistener (this); addwin dow XIstenes (new Window Adaptes () ? Public vold window Closing (Window Event we) 5 System-exit(0);

```
public wild action responsed (Action triend as)?
            try & fac-get sousce() == dresult) &
                  n1 = Integer-passeInt (nums get Tent()).
                 m2 = Integer - passe Int (num2 - get Tent()).
                 /+ if (m == 0) throw new destimetroxception(); x)
                Oct = n1 + " + n2 + ". "
                Desult Num = n1/n2;
               Out += String value Of (result Num);
              sepaint (?
        Eatch (Number Format Exception e1) {
              Out = "Number Format Exception!" + es
              repaint();
        catch ( all themeter Toup tron e2) }
             flag = 1;
             Out = 'Divide by O. Exception!"+ e2;
             repaint ();
public void paint (Graphics 9) 8
     of (flag == 0) ?
        g. drawstring (out, out Result getX() + out Result get wide
                       out Result get 9() + out Result, getter git ()-
    elses
         g draw String (out, 10, 0, 200);
    3 flag = 0;
Public states void main (Strong [] asgs) }
   Division Mains dm = new Division Mains ();
  dm. set size (new Dimensson (800, 400));
dm. set list be ("Division of Integers");
```

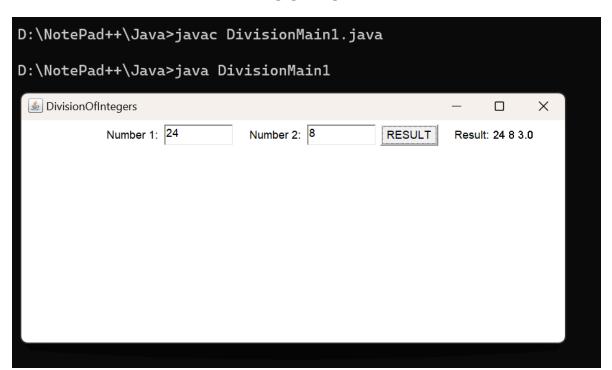
LABORATORY PROGRAM - 10

Demonstrate Interprocess communication and deadlock

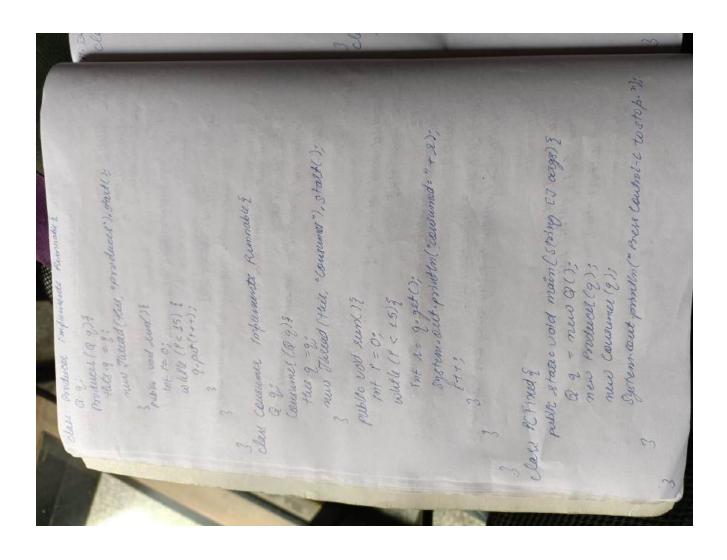
```
class Q {
int n;
boolean valueSet = false;
synchronized int get() {
while(!valueSet)
try {
System.out.println("\nConsumer waiting\n");
wait();
} catch(InterruptedException e) {
System.out.println("InterruptedException caught");
System.out.println("Got: " + n);
valueSet = false;
System.out.println("\nIntimate 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 PCFixed {
public static void main(String args[]) {
Q q = new Q();
new Producer(q);
new Consumer(q);
System.out.println("Press Control-C to stop.");
}
}
```

OUTPUT



Lab-Program-10 24-12-2024 ass Q § Demoustration of interprocess Communication Pnt n; boolean value Set = false, synchronized net get() } while (I value set) 5 System out-println("Incarrences wastery in"); wast(): catch (Intresupred Exception e) { System cert printen ("Intersupted Exception carright"); System out, println ("aot," + n); valuesel = false; Systemout println("In Intrade Produces In"); notify (); & seturn n; synchronized vord put (int m) & while (valueset) 3 System out-pointln(" | n Produces wasting | no); wast(); catch (grossenpred Exception e) ? system-out-println/"mtcesuptedtxception caught"); Hus.n=n; value set = true; System. out. println (" put " " + n). System. out println ("In Internate Cousumes In"); notety();



ii. Demonstration of deadlock

```
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 A.last"); }
}
class Deadlock implements Runnable
 {
 A = new A(); B b = new B();
 Deadlock() {
  Thread.currentThread().setName("MainThread");
  Thread t = new Thread(this, "RacingThread");
  t.start(); a.foo(b); // get lock on a in this thread.
   System.out.println("Back in main thread");
public void run() { b.bar(a); // get lock on b in other thread.
 System.out.println("Back in other thread");
public static void main(String args[]) { new Deadlock(); }
```

```
remonetration of deadlock
   synchronized void troll by
       Carry name = Thread current thread () get Name();
      Syrum-cut protestine name + " entered Afron).
          Thread steep (1000).
       Catch (exception e) {
         System-out printing a rescupred ");
       System-out-pronten (name + "trying to call R. last()");
       L. last ();
   Synchronized void last()}
      Eystem out print ent mich Alast"),
lass Bg
synchronized with bar (A a) &
   String name = Thread current thread () get Name ();
   System out-printly (name + "entered & box");
   by &
      Juread slup (1000);
  Catch (Exception e) }
     System out poutto (Bankery no ");
  Bystemout pointful name + " toying to call A last ()");
  a-lasto;
 Synchronized void last () ?
   System out privath ("Brothe A (ast");
```

class Deadlock implements Rimnable ? A a = new A(); 8 6 = new B(); Deadlock () } Thread-current Thread (). set Name ("Hain Thread") Thread t = new Thread (thes, "Racing Thread") to start(); a. soo(b); Il get lock on a in this thread System out pointen l'Back in mais taxad."). public voed sunt) { 6. bas (a); I get look on 6 in other thread System out printing Back in tother thread" public static void main (Stry [] args) { new Deadlock ():

