#### 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



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#### **B.M.S.** College of Engineering,

Bull Temple Road, Bangalore 560019
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Department of Computer Science and Engineering



#### **CERTIFICATE**

This is to certify that the Lab work entitled "Object Oriented Java Programming (23CS3PCOOJ)" carried out by KATTA CHAITANYA KRISHNA SAI(1BM23CS144), 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/chaitanya-cs23/java-lab-programs-ooj

#### Program 1

Implement Quadratic Equation

```
Or Develop a gave program that prints all real solutions to
    the quadratic equation an2+bx+c=0. Read in a,b,c and use
    the quadratic formula. If the discriminate B-4ac is negative
    display a message stating that there are no eval strition
1) import java. util. scanner;
    public cass equate
    public static void main (sking to angs)
   int a;
   int b;
   int C;
   scanner st = new scanner & system in);
  System . out - print ("Enter 'a' value: ");
   a = sc. next int (1;
  System · out · print ("Enter" b' value: ");
   b = sc-next int ();
  System out print (" Enter c' value:);
   -c = sc. next int();
    froat disc = ((b*b)-4*a*c).
   System. out. point In (disc);
   4 (a == 0)
      System out print In ("Not audratic");
  3
  else
  if (disc <0)
   System out paint in ("No real noots");
  else if ( disc >0)
double noof 1 = (-b+ Nath sget (disc))/(2*a);
```

```
double rot 2 = (-b = Mathospit (disc))/(2+a):
  system - out . print in ( "Poal moots");
  System . out . pount in ( "Roots - 1:" + nots 1);
  system. out- print In(" Root-2:"+ roots 2).
  3 else
 double roof 1 = (-b)1(2*a);
System. out. print In ("Real and egreal");
    system. out. print In ("Roots-1: "+ roots 1);
     system. out. point In ("Roote 2: " + 9 wit 2);
 3
4
                                              Enter à value; 0
OUTPUT:
                         Enter a value: 1
                                              Enter'b' value: 1
Enter a' value: 4
                         Enter 'b' value: 1
                                              Enter'c' value: 2
                        Enter 'c'value:1
 Enter 'b' value: 4
 Enter 'c' value: 1
                                               Not Quadratic
                          No real groots
 Real and equal
 Roet-1:0.0
 Root - 2: 0.0
Ender a' value: 3
Ertler b' value: 8
Enter 'c' value: 2,
  40.0
 Root-1: -0.2792407799438735
 Real mosts
 Roct -2: -2.3874258867227933
```

```
Code:
import java.util.Scanner;
public class Quadratic
  public static void main(String[] args)
    int a;
    int b;
    int c;
    Scanner sc = new Scanner(System.in);
     System.out.print("Enter 'a' value: ");
     a= sc.nextInt();
    System.out.print("Enter 'b' value: ");
    b=sc.nextInt();
     System.out.print("Enter 'c' value: ");
    c=sc.nextInt();
     float disc = ((b*b)-4*a*c);
     System.out.println(disc);
    if (a==0)
       System.out.println("Not Quadratic");
     else
       if (disc<0)
       System.out.println("No real roots");
       else if (disc>0)
       double root1= (-b + Math.sqrt(disc))/(2*a);
       double root2= (-b - Math.sqrt(disc))/(2*a);
       System.out.println("Real roots");
       System.out.println("Root-1: "+root1);
       System.out.println("Root-2: "+root2);
       else
       double root1=(-b)/(2*a);
          System.out.println("Real and equal");
       System.out.println("Root-1: "+root1);
       System.out.println("Root-2: "+root1);
       System.out.println("k.chaitanya");
       System.out.println("1BM23CS144");
```

```
D:\CS144>java equate
Enter 'a' value: 4
Enter 'b' value: 4
Enter 'c' value: 1
0.0
Real and equal
Root-1: 0.0
Root-2: 0.0
k.chaitanya
1BM23CS144
```

D:\CS144>java equate
Enter 'a' value: 1
Enter 'b' value: 1
Enter 'c' value: 1
-3.0
No real roots
k.chaitanya
1BM23CS144

D:\CS144>java equate
Enter 'a' value: 0
Enter 'b' value: 1
Enter 'c' value: 2
1.0
Not Quadratic

}

Microsoft Windows [Version 10.0.22631.4169]
(c) Microsoft Corporation. All rights reserved.

D:\CS144>javac equate.java

D:\CS144>java equate
Enter 'a' value: 3
Enter 'b' value: 8
Enter 'c' value: 2
40.0
Real roots
Root-1: -0.2792407799438735
Root-2: -2.3874258867227933
k.chaitanya
1BM23CS144

D:\CS144>

SGPA Calculator

```
(Re) Develop a gava program to create a class students with
                                                                  Subj
   members USN, name, an averag ordits and an average
                                                                    4
   marks. Include methods to accept and display details and
   method to calculate SGPA of a student
1) import - java util scarner;
  class Subject &
     int works, aredits, geode;
  class students &
                                                                   40
    subject () subject;
     String name, USN;
     double SGPA;
     3canner 's = new Scanner ( system in),
   Student () ,
      subject = new subject [8];
      for lint i=0; ic8; i++){
        subject [i] = new subject ();
void get student Details ( ) i
    System out printin ("Enter Student name: ");
     this name = s. next line ();
     System out print In ("Enter student USN:");
         this . USN = s. next line ();
   void get marks () {
       for civit i=0; ix8; i++){
       system out printin ("Enter narks of subject "+(i+1)+":");
         System out printIn(" Enter credits of subject +i+2)+:
          subject (i] marks = s. next Int();
            subject (i) credits = s. next Int ();
```

```
subject (i) grade = ( embject (i) marks (10);
  if ( subject (i) grade = 10) }
       subject (i) grade = 10;
   else if (surject ti]. grade <0)?
       subject [i] - grade = 0;
 3
void compute SGPA() {
   double points = 0:
  double total credits = 0;
   for ( int i=0 : ix8; i++) {
   Points + = surject [i] ordits * subject [i] gade;
       total credits + = subject (i) · credits;
  SGPA = total credits == 0 ?0: points/total oredits;
  System. out print In ("SGPA of the student is: "+ SGPA).
 void choescanner 1) {
     3. close ();
public class Main &
 public static void main ( String [ ] args ) {
           Student S1 = new Student ();
            S1. get Student Details();
            31. get Marks ();
                                             "+ 31. name);
        System: out PrintIn ( " Name:
        System out FrintIn ("USN:
          SI. compute SGPA();
          S1 · close Scanner ();
       34
```

```
OUTPUT:
    Enter Student Name:
    Chaitanga
    Enter student USN:
     1BM 23C3144
   Enter marks of subject 1:
   Enter credits of subject 1:
   Enter marks of subject 2:
   Enter credits of subject 2:
   Enter marks of subject 3:
  Enter credits of subject 3:
  Enter marks of subject 41
  Enter credits of subject 4:
  Enter marks of subject 5:
 78 Enter credits of subject 5:
 Enter marks of surject 6!
 Enter credits of subject 6:
 Either smarks of subject 7:
Enter credits of subject 7:
Enter marks of subject 8;
Enter credits of subject 8:
Name: chaitanya;
USN: 1BM 23 CS 144
SGPA of the student is: 9.4761
```

```
Code:
import java.util.Scanner;
class Subject {
  int marks, credits, grade;
class Student {
  Subject subject[];
  String name, usn;
  double SGPA;
  Scanner s = new Scanner(System.in);
  Student() {
     subject = new Subject[8];
     for (int i = 0; i < 8; i++) {
       subject[i] = new Subject();
  }
  void getStudentDetails() {
     System.out.println("Enter student name:");
     this.name = s.nextLine();
     System.out.println("Enter student USN:");
     this.usn = s.nextLine();
  }
  void getMarks() {
     for (int i = 0; i < 8; i++) {
       System.out.println("Enter marks of subject " + (i + 1) + ":");
       subject[i].marks = s.nextInt();
       System.out.println("Enter credits of subject " + (i + 1) + ":");
       subject[i].credits = s.nextInt();
       subject[i].grade = (subject[i].marks / 10) + 1;
       if (subject[i].grade > 10) {
          subject[i].grade = 10;
       } else if (subject[i].grade < 0) {
          subject[i].grade = 0;
  void computeSGPA() {
     double points = 0;
     double totalCredits = 0;
     for (int i = 0; i < 8; i++) {
       int sub = subject[i].credits * subject[i].grade;
```

```
points += sub;
    totalCredits += subject[i].credits;
}
SGPA = points / totalCredits;
System.out.println("SGPA of the student is: " + SGPA);
}

public class sgpa {
    public static void main(String[] args) {
        Student s1 = new Student();
        s1.getStudentDetails();
        s1.getMarks();
        System.out.println("Name: " + s1.name);
        System.out.println("USN: " + s1.usn);
        s1.computeSGPA();
}
```

```
D:\1BM23CS144>javac sgpa.java
D:\1BM23CS144>java sgpa
Enter student name:
K.Chaitanya
Enter student USN:
1BM23CS144
Enter marks of subject 1:
Enter credits of subject 1:
Enter marks of subject 2:
89
Enter credits of subject 2:
Enter marks of subject 3:
Enter credits of subject 3:
Enter marks of subject 4:
Enter credits of subject 4:
Enter marks of subject 5:
Enter credits of subject 5:
Enter marks of subject 6:
Enter credits of subject 6:
Enter marks of subject 7:
Enter credits of subject 7:
Enter marks of subject 8:
Enter credits of subject 8:
Name: K.Chaitanya
USN: 1BM23CS144
SGPA of the student is: 9.4
```

Method Overriding

```
socreate a class book which contains four manhers: 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 to string () method that
  could display the complete details of the book overelop a
  gava program to create in book objects
1) import jours util *
  class Books {
  string name, author.
  int price, numpages;
  Books ( String name, String author, int price, int numpages)
  this name = name;
  this - author = author;
  this price = price;
  this numpages = numpages;
  Public String to string ()
String rame, author, price, numpages.
 name = "Bookname: "+ this. name + "in;
author = "Author name: "+ this author +" in";
          "Perce: " + this price + " In";
numpages: "number of pages: "+ this numpages +"in";
   neturn name + author + price + numpages;
```

OVIPUT: Number of books: 1 Class Main ( public datic void main ( string() angs) { enter books nambe: Book Canner input = new Scanner (sydem.in); Enter author 1 name: enid Erter book 1 price: 100 not no Enter book 1 pages: 200 String name; sking author; rame: chaitanya not price; USN: 18M23CSIHH nt numpages. System out print In l'Enter the number of books "); n= input next Int (); Bookes b[]; b = new Books [n]; for (int i=0; i=n; i++) { System · out · printIn ("Enter book name:"); name = injut.nent (); System. out. print In (" Enter author name: "); author = input next (); System out print In ("Enter the price:"); fuice = input. nextInt(); ystam out paint In ("Enter the number of pages:); numpages = int. rest Int (); bris = new Books ( name, author, price, numpages); for (int j=0,jxn,j++) & System not printin ( bcj3 tosking(1); System. out printin ( "name: chaitanya"); System but print In ("USN 1 18M23CS144")

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

```
b[i] = new Books(name, author, price, numPages);
}

for (int i = 0; i < n; i++) {
    System.out.println(b[i].toString());
}

System.out.println("Name:K.chaitanya");
System.out.println("USN:1BM23CS!144");

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

```
D:\lBM23CS144>java Main
Enter the number of books

1
Enter the book name:
air
Enter the author:
raj
Enter the price:
300
Enter the number of pages:
230
Book name: air
Author name: raj
Price: 300
Number of pages: 230

Name:K.chaitanya
USN:1BM23CS!144
```

**Abstract Class** 

```
(ii) Davelop a face program to create an abstract class named
         shape that contains two integers and an empty method named
          print Area () Franke three classes named Rectargle triangle
          and circle such that each one of the classes extends the class
          square shape. Each one of the classes contain only
          Helhod print area () that prints areas of the given shape
      1) import gava util scanner;
       class Input Scanner (
         Scanner scanner = new
         Scanner (System in);
       Public int[]
      get Rectangle Dimensions(){
        System out print ("Enter the length and breadth of nectargle:
        int length = scanner next int();
        int breadth = Sanner nextent ();
        return new int IJf length, breatth 4;
     public int[]
     get triangle Dimensions () {
     System out Print ( "Enter base and height of the knargle: ");
     int base = scanner nextInt ();
      int height = scanner next Int ();
      return new int [] & base, height 3.
    public int get circle Radius () [
   System out print ("Enter the radius of circle:")
      return scanner nextInt();
   public void close () {
      Stanner · close ();
abstract class shape extends
 Input Scanner &
```

```
gillem-out printing "Frea of circle = "+ area),
      int dimension 1)
                                                                      public class area ?.

public static void main (string (Jargs ) ?
       int dimension 2;
     Shape ( Int dumensions, Int dimension 2) {
                                                                      Int ( I reclarge d'inensons = Enpet transer get ficetaigle Dinguisa
                                                                          Input Sanner new Input sanner ();
           this dimension 1 = dimension 1;
                                                                         3 hage rectargle = new Rectargle (rectargle Dimensions TOD);
          this dimension 2 = dimension 2;
                                                                       inte I trangle Dimensions - input Scanner get Triangle Dimeneral;
       abotract void print (kea ();
                                                                            shape Truargle = new
                                                                           Terrangle (triasgle Dimensions(O), triangle Dimension(2));
     class Rectangle extends shape &
                                                                         int circle Rodius = Input Garner-get Circle Rodius ().
        Rectargle (int length, int breadth) (
                                                                                shape circle = new
            super (length. breadth);
                                                                             circle carele Radius);
                                                                          System. out printin ()
                                                                          nectargle print Proat 1.
       a averide
        void print *keal) {
                                                                          triangle printpiece);
          double area = dimension 1 * dimension 2;
                                                                           Circle - print Area ();
        System but printInl "Area of rectangle: "+ area);
                                                                          Input Sanner. Close ();
     class Triangle extends shape &
          Triangle lint base, int height ) {
                                                                        Enter the length and breadth of rectargle = 10
                                                                        OUTPUT
           super base, height);
                                                                          Enter the base and height of triangle
  @ Overwide
                                                                                                       circle
    void print Area () {
                                                                                        radius of
       double area = 0.5 * dimension1 * dimension2;
                                                                           Enter the
       System out Printen ("Area of Tylangle ="tarea);
                                                                           Area of rectargle = 90.0
                                                                           Area of triangle = 40.0
                                                                                    circle 153.93804
class circle entends Shape {
 circle (int radius ) f.
                                                                          NAME: KICHAMANYA
     super (radius, o);
                                                                          USN = 1BM 23CS 144
Overrided then ) {
        double area = Math-PI * path *poro(dimension 1,2)
```

```
Code:
import java.util.Scanner;
class InputScanner {
  Scanner scanner = new Scanner(System.in);
  public int[] getRectangleDimensions() {
     System.out.print("Enter the length and breadth of the rectangle: ");
     int length = scanner.nextInt();
     int breadth = scanner.nextInt();
     return new int∏{length, breadth};
  }
  public int[] getTriangleDimensions() {
     System.out.print("Enter the base and height of the triangle: ");
     int base = scanner.nextInt();
     int height = scanner.nextInt();
     return new int[]{base, height};
  public int getCircleRadius() {
     System.out.print("Enter the radius of the circle: ");
     return scanner.nextInt();
  public void close() {
     scanner.close();
}
abstract class Shape extends InputScanner {
  int dimension1;
  int dimension2;
  Shape(int dimension1, int dimension2) {
     this.dimension1 = dimension1;
     this.dimension2 = dimension2;
  }
  abstract void printArea();
}
class Rectangle extends Shape {
  Rectangle(int length, int breadth) {
     super(length, breadth);
```

```
@Override
  void printArea() {
    double area = dimension1 * dimension2;
    System.out.println("Area of rectangle = " + area);
class Triangle extends Shape {
  Triangle(int base, int height) {
    super(base, height);
  @Override
  void printArea() {
    double area = 0.5 * dimension1 * dimension2;
    System.out.println("Area of triangle = " + area);
class Circle extends Shape {
  Circle(int radius) {
    super(radius, 0);
  @Override
  void printArea() {
    double area = Math.PI * Math.pow(dimension1, 2);
    System.out.println("Area of circle = " + area);
  }
public class Area {
  public static void main(String[] args) {
    InputScanner inputScanner = new InputScanner();
    int[] rectangleDimensions = inputScanner.getRectangleDimensions();
     Shape rectangle = new Rectangle(rectangleDimensions[0], rectangleDimensions[1]);
     int[] triangleDimensions = inputScanner.getTriangleDimensions();
     Shape triangle = new Triangle(triangleDimensions[0], triangleDimensions[1]);
     int circleRadius = inputScanner.getCircleRadius();
     Shape circle = new Circle(circleRadius);
     System.out.println();
    rectangle.printArea():
    triangle.printArea();
```

```
circle.printArea();
System.out.println("\nName: K.chaitanya");
System.out.println("UN:1BM23CS144");
inputScanner.close();
}

D:\144>java Area
Enter the length and breadth of the rectangle: 10 9
Enter the base and height of the triangle: 8 10
Enter the radius of the circle: 7

Area of rectangle = 90.0
Area of triangle = 40.0
Area of circle = 153.93804002589985
```

Name: K.chaitanya

UN:1BM23CS144

Bank Account Algorithm:

5) Develop a gava program to create a class Bank to maintain system but printInt Deposit must be positive ") two kinds of accounts for its customers, one called sturings account and the other current account the variety accounts provides public abstract void withdraw (double amount), compound interest and withdrawal facilities but no chaque book facility the current account provides charie book facility but = public void display Acceptails () { no interest current account holders should also maintain a minimum balance and if the balance falls below this level system-out printin ("Cutomer:" + out name + ", Account:" a service charge is imposed. Balance: "+ balance) · Create a class Account that stores customer name, account number and type of account From this derive the classes cur-acct and saw act to make them from more specific to their negricements Include the necessary methods in order class saw Acc extends Acc & to achieve the following tasks: public cloude interest Range; public saw Acc ( string cust Name, Sking acc Number, double a) Accept deposit from customer and update the balance b) Display the balance interest of compute and deposit interest Super (cut Name, acc Number); this interest Rate = Interest Rate; d) Permit withdrawal and update the balance e) Check for the minimum balance, improve penalty if public and compute Interest () { nelectory and update the balance double interest = balance \* interest Rate 1100; deposit (interest); 1) import gava retil scannes; System out printin ("Interest added: "4" interest), abotat class Account 400 } public string and names public string nect Name; @ override public voil withdraw (double amount) } possible double bal: if ( amount >0 44 amount <= balance) { public Acc ( sking oust name, thing acc Number) { balance = amount; this and Name = gust name; System out printIn("withdrawn: "+ amount); this - acct Number = acc Number; this balance = 0.0; system out printIn ("Invalid withdrawal" onthic void deposit (double amount) { if camount >0) [ balance + = amount; System out print to ("Deposited:"+ amount);

```
account : new Sav Acc Coust Name , acc Number , 5-0).
 Class curace extends acci
                                                                     I else if (account Type equal is ignore case ("current")) {
  public double minimum Balante;
                                                                       Eyelem but print in ! "Enter out have and all number!");
   public double service charge;
                                                                         Hoing - cust Name = Manner-neutline ();
  public - CurAce ( String end Name, string are Number, double
                                                                          String accommunities = example next line();
                                                                          account = new cur Acci (cut name, acc hunder . 500.0,000),
     double servicibage) {
    Super (cust Name, acc Number);
                                                                         system out printint "Inavid account
    this minimum Balance - minimum Balance;
                                                                      3 else &
                                                                         Stanner Mose ();
    thus . service charge = service charge;
                                                                          sotuen. 3
                                                                          system-out printIn("ms reposit 2- withdraw 3. compute Interest
 @ override
                                                                     while true ?
 public void without (double around)
    if (amount > 0 44 (balance - amount)>> minimumbelance) {
                                                                        int choice = lannic next Int(),
      balance -= amount;
                                                                      switch ( choice ) {
       System out print In (withdrawn: "+ amount).
                                                                        Eystern but Print ("Enter deposit amount:")
                                                                      Case 1:
     System but print In ("Invalid withdrawal");
  I else f
                                                                          account details ( sanner northouse (3);
        if (bolance < mintmum Galance) !
                                                                         break.
                                                                           system but print ("Enter witedeand amount:
              balance -= servicecharge;
           System out printin "Service charge: "+ service charge);
                                                                           account deposithdeans ( scanner next Double (3).
                                                                           break.
                                                                     lall 3
                                                                       if (account instance of Santace) [
                                                                                (Savice) actount) compute interest ();
public class bank t
   public static void main (string [ ] args ) {
                                                                            System out Brint Int "systement can only be computed for
                                                                         Jolse L
      Scanner scanner = new scanner (systemain),
     system out print ("Enter account type (savings (Courset) ");
  Iting accounttype = scanner next line 1)
                                                                          break.
                                                                               account displayer Details ();
                                                                          case 4
 Acc account = mull;
  of Caccourt type equals Egnorce lase ("savings"))!
                                                                               beent;
                                                                                  system-out, printent "En NAME: K. CHATTANYA");
     System but print ("Enter aust name and ace number: ");
                                                                         Case 5:
                                                                               janner. close()
                                                                                   system out pointing van: 18M23(5144");
  String and name : scannel next line ();
           all sumber - searner next line ();
```

Enter Account type (sourings/current): current Enter Cust Name and Occ mumber: 13 1 Deposit 2 Withdran 3. Compute Interest 4 Diplay 5. Exit Enter Account type (sawings) (weart): lawings Enter Deposit amount - 1000 Enter cust Name And acc Number: A Deposited: 1000 0 1. Deposit 2. Withdraw. S. Compute Interest 4. Oisplay 5. Enit. Enter withdrawal amount: 250 Enter deposit amount: 1000 withdrawn: 250. 1. Deprosit 2. withdraw 3. Compute Interest 4. Dispays. Ent Interest can only be computed for saving Account Enter withdrawal amount: 200. withdrawn: 200-D austonee: B, Account: 213, Balance: 450.0 Deposited: 40.0. Interest added: 400 customer: a, Account: 123, Balance: 840:0 Mant x thailanga DIN: IBM2XSIU4.

```
Code:
import java.util.Scanner;
abstract class Account {
  protected String custName;
  protected String acctNumber;
  protected double balance;
  public Account(String custName, String acctNumber) {
    this.custName = custName;
    this.acctNumber = acctNumber;
    this.balance = 0.0;
  public void deposit(double amount) {
    if (amount > 0) {
       balance += amount;
       System.out.println("Deposited: " + amount);
     } else {
       System.out.println("Deposit must be positive.");
  public abstract void withdraw(double amount);
  public void displayAcctDetails() {
    System.out.println("Customer: " + custName);
    System.out.println("Account Number: " + acctNumber);
    System.out.println("Balance: " + balance);
class SavAcc extends Account {
  private double interestRate;
  public SavAcc(String custName, String acctNumber, double interestRate) {
    super(custName, acctNumber);
    this.interestRate = interestRate;
  public void computeInterest() {
    double interest = balance * interestRate / 100;
    deposit(interest);
    System.out.println("Interest added: " + interest);
  @Override
```

```
public void withdraw(double amount) {
    if (amount > 0 \&\& amount \le balance) {
       balance -= amount;
       System.out.println("Withdrawn: " + amount);
     } else {
       System.out.println("Invalid withdrawal amount.");
  }
class CurAcc extends Account {
  private double minimumBalance;
  private double serviceCharge;
  public CurAcc(String custName, String acctNumber, double minimumBalance, double
serviceCharge) {
    super(custName, acctNumber);
    this.minimumBalance = minimumBalance;
    this.serviceCharge = serviceCharge;
  }
  @Override
  public void withdraw(double amount) {
    if (amount > 0 && (balance - amount) >= minimumBalance) {
       balance -= amount:
       System.out.println("Withdrawn: " + amount);
     } else {
       System.out.println("Invalid withdrawal amount or insufficient funds.");
    if (balance < minimumBalance) {
       balance -= serviceCharge;
       System.out.println("Service charge of " + serviceCharge + " applied due to low balance.");
public class Bank {
  public static void main(String[] args) {
    Scanner scanner = new Scanner(System.in);
    System.out.print("Enter customer name: ");
    String custName = scanner.nextLine();
    System.out.print("Enter account number: ");
    String acctNumber = scanner.nextLine():
```

```
System.out.print("Enter account type (savings/current): ");
String accountType = scanner.nextLine();
Account account = null;
if (accountType.equalsIgnoreCase("savings")) {
  System.out.print("Enter interest rate: ");
  double interestRate = scanner.nextDouble();
  account = new SavAcc(custName, acctNumber, interestRate);
} else if (accountType.equalsIgnoreCase("current")) {
  System.out.print("Enter minimum balance: ");
  double minimumBalance = scanner.nextDouble();
  System.out.print("Enter service charge: ");
  double serviceCharge = scanner.nextDouble();
  account = new CurAcc(custName, acctNumber, minimumBalance, serviceCharge);
} else {
  System.out.println("Invalid account type.");
  scanner.close();
  return;
while (true) {
  System.out.println("\nMENU");
  System.out.println("1. Deposit");
  System.out.println("2. Withdraw");
  System.out.println("3. Compute interest for Savings Account");
  System.out.println("4. Display account details");
  System.out.println("5. Exit");
  System.out.print("Enter your choice: ");
  int choice = scanner.nextInt();
  switch (choice) {
    case 1:
       System.out.print("Enter the deposit amount: ");
       double depositAmount = scanner.nextDouble();
       account.deposit(depositAmount);
       break;
    case 2:
       System.out.print("Enter the withdrawal amount: ");
       double withdrawalAmount = scanner.nextDouble();
       account.withdraw(withdrawalAmount);
       break;
```

```
case 3:
             if (account instance of SavAcc) {
               ((SavAcc) account).computeInterest();
               System.out.println("Interest can only be computed for Savings Account.");
             break;
           case 4:
             account.displayAcctDetails();
             break;
           case 5:
             System.out.println("K.Chaitanya");
             System.out.println("USN:1BM23CS144");
             scanner.close();
             return;
          default:
             System.out.println("Invalid choice. Please try again.");
} }
```

D:\1BM23CS144>javac Bank.java D:\1BM23CS144>javac Bank.java D:\1BM23CS144>java Bank D:\1BM23CS144>java Bank Enter customer name: B Enter customer name: A Enter account number: 213 Enter account type (savings/current): current Enter account number: 123 Enter account type (savings/current): savings Enter interest rate: 5 Enter minimum balance: 1000 Enter service charge: 10 MENU Deposit MENU 2. Withdraw Deposit 3. Compute interest for Savings Account 4. Display account details 2. Withdraw 3. Compute interest for Savings Account Display account details 5. Exit Enter your choice: 1 Enter the deposit amount: 1000 5. Exit Enter your choice: 1 Enter the deposit amount: 1000 Deposited: 1000.0 Deposited: 1000.0 MENU MENU Deposit 2. Withdraw Deposit 3. Compute interest for Savings Account 2. Withdraw 4. Display account details 3. Compute interest for Savings Account 5. Exit 4. Display account details Enter your choice: 2 5. Exit Enter your choice: 2 Enter the withdrawal amount: 250 Enter the withdrawal amount: 200 Withdrawn: 200.0 Invalid withdrawal amount or insufficient funds. MENU Deposit MENU 2. Withdraw Deposit 3. Compute interest for Savings Account 2. Withdraw Display account details 3. Compute interest for Savings Account 5. Exit 4. Display account details Enter your choice: 3 Deposited: 40.0 5. Exit Enter your choice: 3 Interest added: 40.0 Interest can only be computed for Savings Account. MENU MENU Deposit Deposit Withdraw 2. Withdraw 3. Compute interest for Savings Account 3. Compute interest for Savings Account 4. Display account details Display account details Exit Exit Enter your choice: 40 Invalid choice. Please try again. Enter your choice: 4 Customer: B Account Number: 213 Balance: 1000.0 Deposit 2. Withdraw MENU 3. Compute interest for Savings Account 4. Display account details Deposit 2. Withdraw 3. Compute interest for Savings Account 4. Display account details Exit Enter your choice: 4 Customer: A Account Number: 123 5. Exit Enter your choice: 5 K.Chaitanya Balance: 840.0 USN:1BM23CS144

Packages

```
(8) Areate a Playage CIE which has two classes students and intern
     The shoot dark has members like est name tem. The class inter-
                                                                         super (us n, name, semester);
     derived from student has an away that stones the internal derived from student has an away that stones the internal derived from student has a the counseles of the nauteer stones to the
                                                                          this Internal Marks = internal Marks,
     votident buste another package SEE which has the class
                                                                        public void dispay Internal Nacks () {
       External which is a derived class of votedord this class
                                                                            Syptom. ord. print "Internal Marks
    has an array that wheres the SEE marks occured in five course
                                                                           for int marks: internal ranks) &
     of the severant semister of the student. Import the two
                                                                                 System out print ( rack+" ");
     packages in a file that to declares the final marks of n
                                                                           System out print in ();
      Students in all five courses.
  A) CIE 1student
                                                                         SEE EXTERNAL).
    public class student !
                                                                          package SEE;
   protected show what &
                                                                          import. CIE. Student;
    protected sking name;
                                                                          public class External entends students ?
    protected int semusia;
public Hident ( etting usn, sking name, int semester) {
                                                                           private inter external Marks: new int 151;
                                                                           public External (sking usn, stargrame, int sememeter, int()
        thus win = wen;
        this name = name;
                                                                               super (usn, name, semester);
         this semester = semester;
                                                                                 this faternal Marks = external Marks:
  public vaid display student info () {
                                                                           public unid displayenternal marks ()
     System - oilt - println ("USN of student: "+USN);
                                                                               System out print ("Enteral Nacks:
     Gystem out - printin ("Name of student: "twame);
                                                                                 for (9nt mark: external number) {
    system-out printing "semester of the student: "+ semester);
                                                                                      system- out paint (mark+"").
                                                                                 System out printin();
CHILIN
package cit
 public class friterials extends students
    private Int[] internal marks = int[5];
  public internals ( Hing usn, Etding rame, int generaler, int []
```

```
for 19th 1=0; Pan; 1+1) {
win.
                                                                    Friderials student Internal = new Internal ( usneri), ramostis,
import . CIE internaly.
                                                                                            sameder (i), internal marks (13));
impost SEF. Enternal;
 import gava - util scarner;
                                                                     external student Enternal = new external (veneri), namesti),
                                                                                                        semester (i), external Hacks(i))
public class Main &
= Author status void math (string to args) ?
           Granner granner = new scanner (144tom.in);
                                                                         Student Internal display (Hudent Infol);
                                                                         Hudard Gother rad display Internal Markes 1:
    system out print ("Enter number of Anderits:
                                                                          student enternal display Enternal Hackest!;
        int n: sanner next int ();
                                                                         system out printin (final news:");
    sting [] vons = new string [n);
      string 1 J rames: now exerg End;
                                                                        for ("int ]= 0; jes; j++){
                                                                            int finalmarks(i)(j) + external Marks(ix))
       fut [] semusters: new int [n];
       int [] internal news: new int [n][5];
       Int CICI external racks: Hew int enits);
     for ("int 1=0, ikn; 9++) {
 System-nut printin("In Enter détails for student "+(1+1)+":");
   System and print l'entre usu: ");
                                                                     OVIPUT:
                                                                      Enter no. of students: 1
      venety = sames . next line ();
                                                                        Ender details for student 1:
 system but print! "Enter gamester: ")
                                                                        Enter USN: 1BM23CS141
                                                                          Enter Name: Chaltanya
   semesters [i] = scanner-next hat ();
yoken-out printin ("Enter Internal marks (ofso) for 5 courses: ").
                                                                           Enter Semester: 3
                                                                         Enter "voternal marks for 5 subjects:
     for (int j=0; j < T; j++) t
              internals nacks[i][j] : sanner newlInt();
                                                                            subt:
                                                                            sub 2:
                                                                             SW 3 : 30
   system out printing Enter cexternal marked to from for 5 courses:")
                                                                            Sut 4:
                                                                             Entrz: 30
                                                                           enter external marks for I subjects:
             for ( int ) = 0; Bes; j ++) {
                   external Marks [i][i] = sunner noutInt();
                                                                              WHI: 80
```

- July 4:80 Sub 5:80 Final marks for each student socitails of student 1: USN: 1BM2309144 Name: Chaitanya Sub 1: 110 Sub 2: 110 Sul 3: 10 Sub 4: 100 Sub 5: 110; NAME: K. CHAMANYA PSN: 18M23C0141

```
Code:
package CIE;
public class Internals extends Student {
  protected int[] internalMarks = new int[5];
  public Internals(String usn, String name, int semester, int[] internalMarks) {
     super(usn, name, semester);
     this.internalMarks = internalMarks;
  public void displayInternalMarks() {
     System.out.println("Internal Marks (out of 50):");
     for (int i = 0; i < 5; i++) {
       System.out.println("Course " + (i + 1) + ": " + internalMarks[i]);
package CIE;
public class Student {
  protected String usn;
  protected String name;
  protected int semester;
  public Student(String usn, String name, int semester) {
     this.usn = usn;
     this.name = name;
     this.semester = semester;
  }
  public void displayStudentInfo() {
     System.out.println("Student Details:");
     System.out.println("USN: " + usn);
     System.out.println("Name: " + name);
     System.out.println("Semester: " + semester);
package SEE;
import CIE.Internals;
public class External extends Internals {
  protected int[] externalMarks = new int[5];
```

```
public External(String usn, String name, int semester, int[] internalMarks, int[] externalMarks) {
     super(usn, name, semester, internalMarks);
     this.externalMarks = externalMarks;
  }
  public void displayExternalMarks() {
     System.out.println("External Marks (out of 100):");
     for (int i = 0; i < 5; i++) {
       System.out.println("Course" + (i + 1) + ":" + externalMarks[i]);
  }
import CIE.Internals;
import SEE.External;
import java.util.Scanner;
public class Main {
  public static void main(String[] args) {
     Scanner scanner = new Scanner(System.in);
     System.out.print("Enter number of students: ");
     int n = scanner.nextInt();
     String[] usns = new String[n];
     String[] names = new String[n];
     int[] semesters = new int[n];
     int[][] internalMarks = new int[n][5];
     int[][] externalMarks = new int[n][5];
     for (int i = 0; i < n; i++) {
       scanner.nextLine();
       System.out.println("\nEnter details for student " + (i + 1) + ":");
       System.out.print("Enter USN: ");
       usns[i] = scanner.nextLine();
       System.out.print("Enter Name: ");
       names[i] = scanner.nextLine();
       System.out.print("Enter Semester: ");
       semesters[i] = scanner.nextInt();
       System.out.println("Enter Internal marks (out of 50) for 5 courses:");
```

```
for (int j = 0; j < 5; j++) {
         internalMarks[i][j] = scanner.nextInt();
       System.out.println("Enter External marks (out of 100) for 5 courses:");
       for (int j = 0; j < 5; j++) {
         externalMarks[i][j] = scanner.nextInt();
     }
     for (int i = 0; i < n; i++) {
       Internals studentInternal = new Internals(usns[i], names[i], semesters[i], internalMarks[i]);
       External studentExternal = new External(usns[i], names[i], semesters[i], internalMarks[i],
externalMarks[i]);
       studentInternal.displayStudentInfo();
       studentInternal.displayInternalMarks();
       studentExternal.displayExternalMarks();
       System.out.println("Final Marks:");
       for (int j = 0; j < 5; j++) {
         int finalMarks = internalMarks[i][j] + externalMarks[i][j];
         System.out.println("Course" + (i + 1) + ":" + finalMarks);
       }
       System.out.println("Name: K.CHAITANYA");
       System.out.println("USN: 1BM23CS144");
    scanner.close();
```

DC D:\1903265144 6\ 8 16\\December 6iles\15\\delta 23\\big	
PS D:\18M23CS144-6> & 'C:\Program Files\Java\jdk-23\bin dhat.java\jdt_ws\18M23CS144-6_3a8c2446\bin' 'Main'	Enter External marks (out of 100) for 5 courses:
Enter number of students: 2	70
Enter number of students: 2	70
Enter details for student 1:	70
Enter USN: 1BM23CS144	70
Enter Name: CHAITANYA	70
Enter Semester: 3	Student Details:
Enter Internal marks (out of 50) for 5 courses:	USN: 1BM23CS144
80	Name: CHAITANYA
80	Semester: 3
80	Internal Marks (out of 50):
80	Course 1: 80
80	Course 2: 80
Enter External marks (out of 100) for 5 courses:	Course 3: 80
70	Course 4: 80
70	
70	Course 5: 80
70	External Marks (out of 100):
70	Course 1: 70
	Course 2: 70
Enter details for student 2:	Course 3: 70
Enter USN: 1BM23CS061	Course 4: 70
Enter Name: VATSAL	Course 5: 70
Enter Semester: 3	Final Marks:
Enter Internal marks (out of 50) for 5 courses:	Course 1: 150
80	Course 2: 150
80	Course 3: 150
80	Course 4: 150
80	Course 5: 150
80	Name: K.CHAITANYA
Enter External marks (out of 100) for 5 courses:	USN: 1BM23CS144
70	Student Details:
70	USN: 1BM23CS061
70	Name: VATSAL
70	Semester: 3
70	Internal Marks (out of 50):
Student Details:	Course 1: 80
USN: 18M23CS144	Course 2: 80
Name: CHAITANYA	Course 3: 80
Semester: 3	Course 4: 80
Internal Marks (out of 50): Course 1: 80	Course 5: 80
Course 2: 80	External Marks (out of 100):
Course 3: 80	Course 1: 70
Course 4: 80	Course 2: 70
Course 5: 80	Course 3: 70
External Marks (out of 100):	Course 4: 70
Course 1: 70	Course 5: 70
Course 2: 70	Final Marks:
Course 3: 70	Course 1: 150
Course 4: 70	Course 2: 150
Course 5: 70	Course 3: 150
Final Marks:	Course 4: 150
Course 1: 150	Course 5: 150
Course 2: 150	Name: K.CHAITANYA
Course 2, 150	USN: 1BM23CS144

Exception Handling Algorithm:

```
inheritance free breate 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 thousand
                   wrong Agel) when the input agexo. In son
    the exception
     class, implement a constructor that cases both Father and son's
       age and therows an exception of son's age is >= Fathers age
   1) import fava wil scanner;
      class wrong age extends Exception &
         public wrong Age ( "E
              Super ("Age Euros !");
        public wrong age (string message) {
              super (musage);
    class father f
           protected int father Age;
          public father 1) therows wrong Age ?
           scanner 3 = new south & many there will be
       scanner ( System.in),
              System. out-print ("Enter Father's Age")
                    father Age = s. next Int();
      4 (father Age 20) {
                theras new wrong age ( "Age cannot be negative!").
     3
    4
      public void display () [
               System. out . printin ("Father's Age: "+ father Age);
class son extends fathers
          portivate int son Age;
```

public son() throws wrongage f Enter fathers Age: 35 Janner 3: new Sanner (System.in); system and print ("enter som Age:" Enter Dons Age: 35 Enleption: son's Age cannot be greater than or equal to son age = conext Int (); father's Age. throw new wrong Age ("Age cannot be negative!"); Enter fathers age: 501 if (son Age <0) [ Enter Jons Age = 0. Enter father Age: -23 if (son Age >= father Age) { throw new wrong age ("Jons age cannot be greater than or agnal to fathers age!"); Enception . Age cannot be negative ! NAME: K-CHALLANIA USN: 18M23CS194 @ averide public world display() { system-ord-publing sons Age: "+ son Age); super display (); public class Hain ! public static void main (stringer augu) { Son . Ion := new Son ! ); son displayes; 3 witch (wrong Age e) 1 system

```
Code:
import java.util.Scanner;
class WrongAge extends Exception {
  public WrongAge() {
    super("Age Error!");
  public WrongAge(String message) {
    super(message);
class Father {
  protected int fatherAge; // Age of the father
  public Father() throws WrongAge {
     Scanner s = new Scanner(System.in);
     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; // Age of the son
  public Son() throws WrongAge {
    super(); // Call Father constructor
     Scanner s = new Scanner(System.in);
    System.out.print("Enter Son's Age: ");
    sonAge = s.nextInt();
```

```
if (sonAge < 0) {
      throw new WrongAge("Age cannot be negative!");
    if (sonAge >= fatherAge) 
      throw new WrongAge("Son's age cannot be greater than or equal to father's age!");
  }
  @Override
  public void display() {
    super.display(); // Call Father's display method
    System.out.println("Son's Age: " + sonAge);
}
public class Main {
  public static void main(String[] args) {
    try {
      Son son = new Son(); // Create Son object (also initializes Father)
      son.display(); // Display ages of father and son
    } catch (WrongAge e) {
      System.out.println("Exception: " + e.getMessage());
  }
D:\1BM23CS144>javac Main.java
D:\1BM23CS144>java Main
Enter Father's Age: 35
Enter Son's Age: 35
Exception: Son's age cannot be greater than or equal to father's age!
D:\1BM23CS144>javac Main.java
D:\1BM23CS144>java Main
Enter Father's Age: 1
Enter Son's Age: 0
Father's Age: 1
Son's Age: 0
D:\1BM23CS144>javac Main.java
D:\1BM23CS144>java Main
Enter Father's Age: -23
Exception: Age cannot be negative!
```

Threads Algorithm:

```
write a pigram which creates two threads, one thread diplaying
    " PMS college of Engineering" once every ten seconds and another
                                                                            I catch (Interrupted Exception e) }
                                                                                    System. out - printin (e),
   displaying "CSE" once every two seconds
   class college Thread extends thread !
                                                                             System out printer ("USN: 1842.3C5144");
      public void nunt) i
                                                                              System out printing "NAME: KICHATTANYA
         try &
           while (true) ?
                   System out . Println ("BMSCE")
                    thread-sleep (10000),
                                                                          DUTPUT
             5 catch 1 Interrupted Ecception e) ?
                                                                          BMSCE
                                                                           CSE
                  system . out - print in (e)
                                                                          CSE
                                                                          CSE
                                                                          CSE
BMSCE
class CSE thread extends thread?
        try f while ( true) {
               System · but printin(iSE);
thread sleep (2000);
                                                                         USN: 1BH23CS144
                                                                          NAME: K. CHATTAN'M
       3 (atch (Interrupted Exception e) &
         system . out printince);
public class Main f
  public static void main (thing [ ] args) [
       College thread collegethread = new College thread 1);
         CSE Thoread cse theread = new est Thoread ().
       college thread-start ().
        cse Though . start ();
       kyl
```

```
public void run() {
    try {
      while (true) {
        System.out.println("CSE");
        Thread.sleep(2000);
    } catch (InterruptedException e) {
      System.out.println(e);
public class Main {
 public static void main(String[] args) {
    CollegeThread collegeThread = new CollegeThread();
    CSEThread cseThread = new CSEThread();
    collegeThread.start();
    cseThread.start();
    try {
      Thread.sleep(20000);
    } catch (InterruptedException e) {
      System.out.println(e);
    System.out.println("USN:1BM23CS144");
    System.out.println("Name:K.CHAITANYA");
 D:\1BM23CS144-8>javac Main.java
 D:\1BM23CS144-8>java Main
 BMS College of Engineering
 CSE
 CSE
 CSE
 CSE
 CSE
```

BMS College of Engineering

CSE CSE CSE CSE

USN:1BM23CS144 Name:K.CHAITANYA

class CSEThread extends Thread {

Open End Question 1 Algorithm:

```
4) was that creates a user interface to perform integer divisions.
the user enters a war interface to perform integer division.

NOW 2 the division of NOWA and NOWA2 is displayed in the result field when the NowA ment and NOWA2 is displayed in the result field when the NowA bettern is clicked the NOWA or NOWA2 were NOW are integers, the program would know a number formal Supplier of NOWA2 were your the program would know an integer for the program would know an integer formation to telephon in a message display but
                                                                                               Entton - add Action-distance (new Action distance) () }
                                                                                                    public world action performed (action event ext) [
                                                                                                         int a = Integer · passeInt (ajtif · get text() ?;
                                                                                                         int b = Integer . parse Int ( bit f get text ());
                                                                                                        int ans = a/b.
1) import . fava x . swing . *
                                                                                                       alab - set Text ("A = "+a);
   import gana aut.
                                                                                                       blab-set-Text (B="+b);
   Import java aut-event. ";
                                                                                                        anolab wettext ("Ano= "+ ano);
                                                                                                   3 catch (Number format Exception e) {
class swing wenn of
                                                                                                       atab set toxt (").

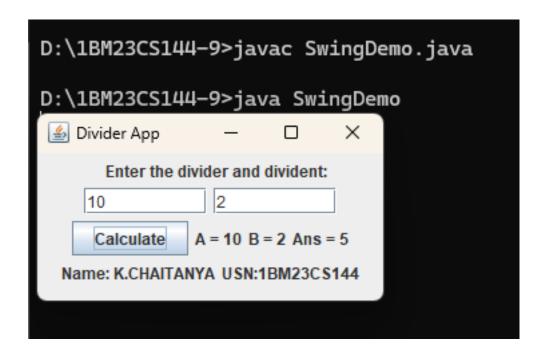
blab set toxt (").

anolab ret text");
        Swing Demo () {
           I Frame jfrm = new I Frame ("Divider App"):
                                                                                                        ever set text ( "Enter only Integers! ");
             j+m · set size (275, 150);
             ifrm set layout (new Flow Layoutl);
                                                                                                     3 catch (Arthimetic Exception e) {
             j+m. set refault close operation (I frame . Ex 17-0N_ class)
                                                                                                         alab set text!" "). blab settext!" "
          I taket . Ilab = new I taked ( "Enter the divider and divident).
                                                                                                         anolab.settent ("")
          I text field - ajt + = new Trext field (8);
                                                                                                          our settent!" B should be NOW zono! ),
           I text field bit = new I text field (8);
                                                                                                 33
          Toutton button = new J Button ("(alulate")
                                                                                                    ifrm- set visible (true),
      Jhabel err = new Jhabel U;
      Jablel alab = New Jabel();
                                                                                                public static void main ( String argal) &
     Idabel = blab = new Itakel();
      Thabel Eurolab = new Thabell);
                                                                                                    sing variaties: invoke leter ( new Runnable !) }
                                                                                                          public void rune ) ;
     I from add (ever);
                                                                                                                  new Swing Demol);
     frm-add (ilab);
     jfrm add ( aitf);
     frm add bittle
      frm addl button),
  ifm add (alab);
ifm add (blab);
ifm add (anslab);
```

Enter the	divider and dividend  A=10 B=2 And=5
	(creo to - 1000 3 factions delenant
	Charten all plus 12 to 3 to 4 to 1000

```
Code:
import javax.swing.*;
import java.awt.*;
import java.awt.event.*;
class SwingDemo {
  SwingDemo() {
    JFrame ifrm = new JFrame("Divider App");
    jfrm.setSize(275, 150);
    ifrm.setLayout(new FlowLayout());
    jfrm.setDefaultCloseOperation(JFrame.EXIT ON CLOSE);
    JLabel jlab = new JLabel("Enter the divider and divident:");
    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();
    JLabel nameLabel = new JLabel();
    JLabel rollNoLabel = new JLabel();
    jfrm.add(err);
    ifrm.add(jlab);
    ifrm.add(ajtf);
    jfrm.add(bjtf);
    ifrm.add(button);
    jfrm.add(alab);
    ifrm.add(blab);
    ifrm.add(anslab);
    ifrm.add(nameLabel);
    ifrm.add(rollNoLabel);
    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(""); // Clear error label if valid input
          } 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!");
  });
  nameLabel.setText("Name: K.CHAITANYA");
  rollNoLabel.setText("USN:1BM23CS144");
  jfrm.setVisible(true);
public static void main(String args[]) {
  SwingUtilities.invokeLater(new Runnable() {
    public void run() {
       new SwingDemo();
  });
```



Open End Question 2 Algorithm:

```
End
                  Question 2
10) Opend
    Dead lock
    class A E
     synchoconized void too (B b) {
       I king name = thread · convent thread (). get Name ();
         System . out printing name + " entered * foo");
              trys
                  Thread . sleep (1000);
             3 catch ( Encephon e) t
                  system - out . printin (" A Intercripted"),
       system - but printin ( name + "trying to call - 8. last ()"),
           b. last();
     sychownized word last()
          system out println ("Inoide A-last");
                         and offer 9 " rolling forg. to be
     4
  Class B
    synchronized void bar (A a) i
        string name = thread - current thread () get Name ();
         Sigstem tut println (name + "entered B-bar");
          thread sleep (1000);
       3 catch (Exception e) {
           system out println ("B interrupted");
         system but printen (name + "trying to call A. last ()"),
        a-last();
   24
```

```
synchronized void last () [
         system. out. println ("Inside B-last");
  2
   public class Deadlock implements krunnable ?
           a = new Al );
          b = new B();
      thread: current thread () set same ("Main thread");
     Deadlak () 1
      Thread t= new thread (this, "Raing Thread");
       t'start'();
       system out printing "Back in main thread");
   public void nun() {
         b. bar (a);
         system . out printly ("Back in other thread
  public static void main ( skings args ( ) ?
       Eysten out printing "USN: 12M23c3144",
        System . out . printin ("NAME: K. CHATTANYA"),
           new Deadlock ();
   3
TUPTU (
Racingthread entered B-bar
Main Thread entered A for.
 Main Thread taying to call B. last ()
 Racing theread trying to call 1. last ()
      USN: 18M2 3CS144
       RYMATIAN . N = 3 MAN
```

```
Code:
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");
}
public 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);
    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∏) {
     System.out.println("USN: 1BM23CS144");
    System.out.println("Name:K.CHAITANYA");
```

Algorithm: 4) Ficter- Process Communication class a fut n: boolean value set - falso. Synchronized led get () { while (! value set ) [ system out printin ("in consumer waiting in")." 3 outch 1 Interrupted sneepton e) L system . trut . printin ( "Interrupted Exception caught"); & system out - printer ("Got:"+n); value set = false; System out print un l'interinate broducer in"), notify (); neturne; Synchronized void put (int n) & while ( value set ) { try & Syxtem . out - printher ("M Beaducer waiting "); want (); 3 catch (Interrupted sucception e) [ System . out pindln Etriterupted exception caught", 4 this n= n; value set = true; System. out println ("Pud:"+1); System out printer ("in Intimate consumer in"), notify();

```
Caso hadures implements Runnable !
                                                                         system - but pointing these control-c to stop", system - but pointing on USN: 18M33CS144 "N
      Q 9;
     haducer ( a a) i
          this q=q:
          now thread ( this, "Produce") Hart()
                                                                      DUTPUT
      Public void run () [
                                                                       Put 0
           int i = 0;
                                                                        Indinate Consumer
                                                                        house waiting
                                                                         Got : 0
                                                                          Antimate holices
                                                                            Put 1
  Class consumer Simplements Runivable &
                                                                          Consumed: 0
                                                                            Intimale Consumer
     a av.
                                                                           Robert waiting
    Consumer (QQ) {
                                                                           Got : 1 .
       this -9 = 9;
       new thread (this, consumer') start ();
                                                                          Intimate hoducer
                                                                           consumed: 4
                                                                             Put: 2
public und sum () f
                                                                           gotinale consumer
      int = 0;
                                                                            Produce waiting
     while lie 15) £
                                                                            Got: 2
                                                                             Intimate broducer
        intr= q get ();
       System . tut . printin ( "lonained :
                                                                               Consumed: 2
                                                                                 Put: 3
                                                                                 Intinate consumer
                                                                               broduce waiting.
public class Main t
    public static void main ( thing argel 1) [
            & a = new & ();
```

```
Code:
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++
```

```
public class Main {
  public static void main(String args[]) {
    Q q = new Q();
    new Producer(q);
    new Consumer(q);
    System.out.println("Press Control-C to stop.");
    System.out.println("\nUSN: 1BM23CS144\nName:K.CHAITANYA");
}}
```

```
C:\Windows\System32\cmd.e
Microsoft Windows [Version 10.0.22631.4460]
(c) Microsoft Corporation. All rights reserved.
D:\1BM23CS144-INTER_PROCESS COMMUNICATION>javac Main.java
D:\1BM23CS144-INTER_PROCESS COMMUNICATION>java Main Press Control-C to stop.
USN: 1BM23CS144
Name:K.CHAITANYA
Put: 0
Intimate Consumer
Producer waiting
Got: 0
Intimate Producer
Intimate Consumer
Producer waiting
Consumed: 0
Got: 1
Intimate Producer
Consumed: 1
Purt: 2
Intimate Consumer
Producer waiting
Intimate Producer
Consumed: 2
Purt: 3
Intimate Consumer
Producer waiting
Intimate Producer
Consumed: 3
Purt: 4
Intimate Consumer
Producer waiting
Got: 4
Intimate Producer
Consumed: 4
Put: 5
Intimate Consumer
Producer waiting
Got: 5
Intimate Producer
Consumed: 5
Purt: 6
Intimate Consumer
Producer waiting
```

× C:\Windows\System32\cmd.e C:\Windows\System32\cmd.e Producer waiting Intimate Consumer Got: 6 Intimate Producer Producer waiting Consumed: 6 Put: 7 Got: 9 Intimate Consumer Intimate Producer Producer waiting Consumed: 9 Put: 10 Got: 7 Intimate Producer Intimate Consumer Consumed: 7 Put: 8 Producer waiting Intimate Consumer Got: 10 Producer waiting Intimate Producer Got: 8 Consumed: 10 Intimate Producer Put: 11 Consumed: 8 Put: 9 Intimate Consumer Intimate Consumer Producer waiting Producer waiting Got: 11 Got: 9 Intimate Producer Intimate Producer Consumed: 9 Put: 10 Consumed: 11 Put: 12 Intimate Consumer Intimate Consumer Producer waiting Got: 10 Producer waiting Intimate Producer Got: 12 Consumed: 10 Put: 11 Intimate Producer Intimate Consumer Consumed: 12 Put: 13 Producer waiting Intimate Consumer Got: 11 Intimate Producer Producer waiting Consumed: 11 Put: 12 Got: 13 Intimate Consumer Intimate Producer Producer waiting Consumed: 13 Put: 14 Got: 12 Intimate Producer Intimate Consumer Consumed: 12 Put: 13 Got: 14 Intimate Consumer Intimate Producer Producer waiting Consumed: 14 Got: 13 D:\1BM23CS144-INTER\_PROCESS COMMUNICATION> Intimate Producer