VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.



LAB REPORT on

Object Oriented Java Programming (23CS3PCOOJ)

Submitted by

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in partial fulfillment for the award of the degree of BACHELOR OF ENGINEERING
in
COMPUTER SCIENCE AND ENGINEERING



BENGALURU-560019 Sep-2024 to Jan-2025

B.M.S. College of Engineering,

Bull Temple Road, Bangalore 560019
(Affiliated To Visvesvaraya Technological University, Belgaum)

Department of Computer Science and Engineering



CERTIFICATE

This is to certify that the Lab work entitled "Object Oriented Java Programming (23CS3PCOOJ)" carried out by **Anirudh Raghunand (1BM23CS036)**, 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.

Sheetal V A Assistant Professor Department of CSE, BMSCE Dr. Jyothi S Nayak Professor & HOD Department of CSE, BMSCE

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Github Link:

https://github.com/AnirudhR036/JavaLab

Program 1
Implement Quadratic Equation

Pag*
import java util Scanner; import quea lang. Mith; class Quadratic &
public state woid main (string argo []) {
double d, r1, 82; Scanner s= revo Scanner (System-in);
System - out printle ("Enter the coefficient a"); a = S. next Int ();
System - out . println (" Enlar . the coefficient b") b = s . result Int ();
System. out . println ("Enter the coefficient c") c=s. next Int ();
20/2/10/20/5
System - out. print In (° Not a quadratic) center non-zero value of a "); a = S. next Int ();
a = S. next Int();
3
d=b*b-4*a*c;
4(4)0){
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System out printly ("The equation has real and distinct upots");
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DatePage
\$2 = ((-b) (2°a)+ (Math · sqrt (d))/(2°a)); System · out - println (°The roots are '); System · out - println ('82 = "+82); System · out · println ("82 = "+82);
into the conficient of
else if (d== 0) {
System out plintln ("The organism has real and oqual roots");
System · out println (The root 6 4+ r1)
Jaslem · out println (The root 64+1)
else }
System out printen ("The equation down't have real roots")
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the conclin december and not seed
3
3.
n + +
Enter to coefficient a
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Enter the coefficient b
0
Entre the coefficient <
-4

Page ____ the roots are

\$1 = 2.0

\$2 = 2.0 Enter the coefficient a Enter the coefficient b Enta No coefficient c The squation has real and equal roots Enter the coefficient a Enter the coefficient b Enter the coefficient 2 The equation doesn't have real roots.

```
Code:
import java.util.Scanner;
import java.lang.Math;
class Quadratic{
public static void main(String args[]){
   int a,b,c;
   double d,r1,r2;
   Scanner s= new Scanner(System.in);
   System.out.println("Enter the coefficient a");
   a=s.nextInt();
   System.out.println("Enter the coefficient b");
   b=s.nextInt();
   System.out.println("Enter the coefficient c");
   c=s.nextInt();
   while(a==0){
    System.out.println("Not a quadratic, enter non-zero value of a");
    a=s.nextInt();
}
    d=b*b-4*a*c;
    if(d>0){
    System.out.println("The equation has real and distinct roots");
    r1=((-b)/(2*a)+(Math.sqrt(d))/(2*a));
    r2=((-b)/(2*a)-(Math.sqrt(d))/(2*a));
    System.out.println("The roots are");
    System.out.println("r1="+r1);
    System.out.println("r2="+r2);
   }
    else if(d==0){
        System.out.println("The equation has real and equal roots");
       r1=((-b)/(2*a));
        System.out.println("The root is "+r1);
```

}

```
else{
    System.out.println("The equation doesn't have real roots");
}
System.out.println("Name:Anirudh");
System.out.println("USN:1BM23CS036");
}
```

Output:

```
Microsoft Windows [Version 10.0.22000.2538]
(c) Microsoft Corporation. All rights reserved.
C:\Users\Admin>Desktop\1bm23cs036
'Desktop\1bm23cs036' is not recognized as an internal or external command,
operable program or batch file.
C:\Users\Admin>cd Desktop\1bm23cs036
C:\Users\Admin\Desktop\1bm23cs036>javac Quadratic.java
 :\Users\Admin\Desktop\1bm23cs036>java Quadratic
Enter the coefficient a
Enter the coefficient b
Enter the coefficient c
The equation has real and equal roots
The root is -1.0
Name:Anirudh
USN:1BM23CS036
C:\Users\Admin\Desktop\1bm23cs036>java Quadratic
Enter the coefficient a
Enter the coefficient b
Enter the coefficient c
The equation has real and distinct roots
The roots are
1=2.0
r2=-2.0
Name:Anirudh
USN:1BM23CS036
C:\Users\Admin\Desktop\1bm23cs036>java Quadratic
Enter the coefficient a
Enter the coefficient b
Enter the coefficient c
The equation doesn't have real roots
Name:Anirudh
USN:1BM23CS036
```

Program 2 SGPA Calculator

Date//_
ScripA calculation
import java - util . scannor;
clam St. 1 It IS
class Stud-details {
51 20 L CD:
int marks [] = new int [8]; int cred [] = new int [8];
Ctal
String name, um; double sapa
Scarall Son C 18 + 1
Scanner sc = neue Scanner (System.in);
IN aid atdatile (1)
System out print he () {
system our punion to her the UNIX
Won = Sc. next();
System out - println (" Enter the some");
noine - Sc. vent ls,
for (Int 7 = 0; il 8; i++) {
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marks[i]=sc-nentInt();
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Medit Les = sc. neatint()
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A T A A L L L
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$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Stud-details sI[] = Now Stud-dd
and black	for (int 5=0, ja3; j++) { SI[i] = new Stud-dete
2- marks [i](10; switch(2) {	
Case 10: grapoint=10; bleak;	for (ind 5=0; i < 3; i ++) } SOP ("Ent the details of" + (5+1) + " Student"
case 6	SICIJ-getdetaib(1); SICIJ CalcsGPA();
Case 4: grapoint: 1+7; brak;	3 for (in) j = 0; v < 3; j++) }
case 2: Case 1: SOP("Fail"); brook;	so lo J. display ();
Jun = um + (groß aint and Fill);	3
50 f (sum);	}
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```
Code:
import java.util.Scanner;
class Stud_details{
       int marks[]=new int[8];
       int cred[]= new int[8];
       String name, usn;
       double sgpa;
       Scanner sc =new Scanner(System.in);
       void getdetails(){
               System.out.println(" Enter the USN ");
               usn=sc.next();
               System.out.println(" Enter the name ");
               name=sc.next();
               for(int i=0; i<8; i++){}
                      System.out.println(" Enter the mark ");
                      marks[i]=sc.nextInt();
                      System.out.println(" Enter the credit ");
                      cred[i]=sc.nextInt();
void display(){
       System.out.println("usn"+" "+usn);
       System.out.println("name"+" "+name);
       System.out.println("SGPA is"+this.sgpa);
}
void calcSGPA(){
       int sum=0;
       int grdpoint=0;
       int x;
       for(int i=0; i<8; i++){
```

```
x=marks[i]/10;
               switch(x)
                       case 10: grdpoint=10;break;
                       case 9:
                       case 8:
                       case 7:
                      case 6:
                      case 5:
                      case 4: grdpoint=x+1;break;
                      case 3:
                       case 2:
                      case 1:System.out.println("Fail");break;
               sum=sum+ (grdpoint*cred[i]);
}
       System.out.println(sum);
       this.sgpa=sum/20.0;
}
}
class Student{
       public static void main(String args[]){
               Stud_details s1[]=new Stud_details[3];
               for(int j=0; j<3; j++){
                      s1[j]=new Stud_details();
               for(int j=0; j<3; j++){
                      System.out.println("Enter the details of "+(j+1)+" Student");
                      s1[j].getdetails();
                      s1[j].calcSGPA();
for(int j=0; j<3; j++){
       s1[j].display();
}
}
}
```

```
Microsoft Mindows (Version 10.0.2631.4317)
(c) Microsoft Corporation. All zights reserved.

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SGPA is9.35
usn 28
name amith
SGPA is10.0
```

Program 3

Book Program

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tab Program - 3	
	public String to String () }
Import says atil Sconner;	
	rellula "Name: "+ name + 'In Author:
class Book &	Pii " In Pages: " + num pages + "In
	return "Name: "+ name + 'n Author: + author + "In Pages: "+ num pages + "In Price: + price; }
String name, author; in num pages; double price;	3
in num - pages;	
double price;	class Book Damo E
	See II strict 2
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	3
Scanner SC = now Scarrer (System in	
System - Out-print In (" Enter Name: "):	System - out point (" Enter number of poor in book Num - sc. next Int ();
this name = sc next();	System - out print (" Enter number of hos
System - out - prindln (" Enth Author: ")	in book Num - SC. next Int ().
System out printle ("Eith Pages")	Book Look Array [] = new Book [books
this num pages - sc next (nt (1)	
System out printer CoEnter pice: 4	for (a) 0=0/12 hoop Num ; 1+1)}
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	Enla pice 8003
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```
Code:
import java.util.Scanner;
class Book{
  String name, author;
  int num pages;
  double price;
  void setDetails(){
     Scanner sc = new Scanner(System.in);
     System.out.print("Enter Name:");
    this.name = sc.next();
     System.out.print("Enter Author:");
    this.author = sc.next();
    System.out.print("Enter Pages:");
    this.num_pages = sc.nextInt();
     System.out.print("Enter Price:");
    this.price = sc.nextDouble();
    return;
  }
  void getDetails(){
    System.out.println("Name: "+name+"\nAuthor: "+author+"\nPages: "+num_pages+"\nPrice:
"+price);
    return;
  }
  public String toString(){
    return "Name: "+name+"\nAuthor: "+author+"\nPages: "+num_pages+"\nPrice: "+price;
}
class BookDemo{
  public static void main(String args[]){
     Scanner sc = new Scanner(System.in);
    System.out.print("Enter the number of books: ");
    int bookNum = sc.nextInt();
    Book bookArray[] = new Book[bookNum];
    for(int i = 0; i < bookNum; i++){
    bookArray[i] = new Book();
    bookArray[i].setDetails();
     System.out.println();
```

```
for (int i = 0; i<bookNum; i++){
  bookArray[i].getDetails();
    System.out.println(bookArray[i]);
}
   System.out.print("Name: Anirudh R");
   System.out.print("USN: 1BM23CS036");
}
}
C:\Users\bmsce\Desktop\1BM23CS036>javac
C:\Users\bmsce\Desktop\1BM23CS036>javac
```

```
C:\Users\bmsce\Desktop\1BM23CS036>javac BookDemo.java
C:\Users\bmsce\Desktop\1BM23CS036>java BookDemo
Enter the number of books: 3
Enter Name: java the complete reference
Enter Author:Herbert Schildt
Enter Pages:1912
Enter Price:800
Enter Name:Computer Organization and Architecture
Enter Author:William Stallings
Enter Pages:400
Enter Price:700
Enter Name:Introduction to Logic Design
Enter Author:Alan B Marcovitz
Enter Pages:300
Enter Price:400
Name: java_the_complete_reference
Author: Herbert Schildt
Pages: 1912
Price: 800.0
Name: Computer_Organization_and_Architecture
Author: William Stallings
Pages: 400
Price: 700.0
Name: Introduction_to_Logic_Design
Author: Alan B Marcovitz
Pages: 300
Price: 400.0
Name:Anirudh R
USN:1BM23CS036
```

Program 4
Abstract Class shape program

Date
Program 4
import java util Scanna; import java long Math;
abstract class Shape &
double ly a; double by b;
Rectangle (double a , double
abstract uroid print A reas ();
class Rectangle extends Shape ?
double l;
double l; double br; Rectangle (double a, double b) { l = a,
l=a; double b / 3
b8=b;
A STATE OF THE STA
1970; d 21; #A 00 115
System-Dert - println la The Area
of the socionale is:
£ + 1 + 6 +);
3

DatePage	Dute/
class Triangle extends Shape ?	class Shape Demo 3
double h; double b; Triangle (double a, double b) ? h = a; this b = b;	Ps um (String args [7) }
Triangle (double a, double b) {	Reclarate += new Reclarage (2,5) Triangle t = new Triangle (2,5) Circle c = new Circle (5);
tis. 6 = 6)	Circle c = none (inde 15);
roid print Alea [1]	t-Print Area (); t-Print Area ();
roid print Alea (12 System out print la ("The area of triangle is: "+(10°5)/20);	(.Print Alea ();
3 Change deput to a land	3 Output
class Circle extends Shape }	The state of the s
double x	Area of triangle is 10 Area of triangle is 5 Area of circle is 18.539
ande (double +13 this +=+;	And of circle is 18.539
void print Area (12	
void print Area (12 System - put - frint In ("The area of circle is - " + Math . PI" & " of);	and au
3 Red San Assaula Marie	2310 24
4 16 16 16 16 16 16 16 16 16 16 16 16 16	
	The land to be the little

```
Code:
import java.util.Scanner;
import java.lang.Math;
abstract class Shape {
       double a;
       double b;
       abstract void printArea();
class Rectangle extends Shape{
       double 1;
       double br;
 Rectangle(double a, double b){
       l=a;
       br=b;
}
       void printArea(){
               System.out.println("The Area of the rectangle is: "+l*br);
class Triangle extends Shape{
       double h;
       double b;
       Triangle(double a, double b){
               h=a:
               this.b=b;
       void printArea(){
               System.out.println("The Area of the Rectangle is: "+(h*b)/2.0);
class Circle extends Shape{
       double r;
       Circle(double r){
               this.r=r;
       void printArea(){
               System.out.println("The area of the Circle is: "+ Math.PI*r*r);
       }
class ShapeDemo{
       public static void main(String args[]){
               Rectangle r = new Rectangle(2,5);
               Triangle t = new Triangle(2,5);
               Circle c = new Circle(5);
```

```
C:\Users\bmsce\Desktop\1BM23CS036>javac ShapeDemo.java
C:\Users\bmsce\Desktop\1BM23CS036>java ShapeDemo
The Area of the rectangle is: 10.0
The Area of the Rectangle is: 5.0
The area of the Circle is: 78.53981633974483
Name:Anirudh R
USN:1BM23CS036
```

Program 5
Bank program

Page	Date//
import your util . Scanner;	clars Saw Acct extends Account &
abstract class Account ?	double interest Parte =005;
proof String customer Name;	Sove Acet (String costema Nano, int account
private at account Type;	
	Sup in (austing Name, account Number, "Saving", belonce);
account Number, String account Type, double balance) ?	vaid intered () E
this customy Name = customer Name;	balance += interest;
	System · Out print In ("Interest adda) New bolis
/ Wr - accent Type = accent Type; this balance = balance;	viaid with draw (double anout) ?
used deposit (double amount) {	if (halance >= amount) } palance -= amount
Nava Balony. + Islango:	Successful Now balance + balance)
Nava Ealong. + Valanco);	3 - 12
vaid display () {	System out printer l'Insufficiant belance";
Sustan and print In (" Balance" + polance);	3 balance");
abstract road intend(); abstract road with draw (double amount).	And the mater things of the
3	

DatePage	Date// Page
class Cur Acet awards Account &	che quellans action [chequid ++] = amount;
double scharge = 50.00; double scharge = 50.00; double] chaquebanractia : new table [va]	elx & SOP("Insufficient balance");
ind chaquid = 0;	3
(w. Acct (String austener Name, int account Number double balance) ?	uraid displaytransoction()? for (int i=0, ix chaqueid; i+1)? SOP("Transoction" + (i+1) + ""+
super (ustomer Name, account Adumbus "Current", balanca;	Chapethorosactacti); }
waid interest () {	public class bonk & public static croid main (string[] args] & Scanner scanner = naue commer (system in);
Sop("Interest cannot be calculated");	Sof ("Enter account type (2 for sovings, 2 forwer) int chace = scanner nout Int ();
roid withdraw (down be anount) &	scanner neat Line ();
d (balance >= amount) { balance == amount;	String name: Scanner next Int ()
balance = scharge;	30P1 Enter Initial balance"); double talon e : some nort Double !!;
has been diducted. The new halan wis" + balance);	Account account and in
else 2	if (choice = 1) & saic Acet (some acette) ac count = none Saic Acet (some acette) balance J; }
SOP ("The applate balance is "+ balance);	else if (choice = = 2) & arout = new autect (name, account, balance); }

DatePage	
	Date Page
	Name: Anirudh R
SOP (" Invalid account type solected.").	USM: 1BM23CS036
SOP (" I would allow uppe strate")	Choose an account type:
return;	1: Sourings Account
3	Choose an account type: 1: Savings Account 2: Current Account
int earl = 0;	<u> </u>
Soft of the the function to be done ");	Charge an Action:
Caller of the mariner to be come?	1. Ochosit
ond deposit interest Int Withdraud Ins. Frit"	2. Display bulance
and algort into a met. without ms. +xill	3. Compute Interest (Sawings only)
int option = scannor sout(it();	4. Withdrane
swild loption &	5- Exit
case 1 · Sof (" Enth deposit amount"); double deposit Amount = scanna - ment Poubles;	1
acus v dapos T Aman - scenna - ment Voublet.	Enter amount to deposit: 1000
account deposit (deposit Amount);	Deport successful 1 New balence: 2000. 0
break;	Choise on action.
Case 2 " a count display ();	2 Deposit
y (chail = = 2) }	2 Display Balance
Clara Aced) account) - display Transactions;	3 Comparte Inlust Sairings only
3 DJOAR,	Ki la lithologue
Case 4 : Lystem out println ("Entr withdraw	5 - Ext
case 4 : System out printly ("Entre withdraw	2 ca also palle scholare
amount.");	Balance for account mumber 1001: 2000 0
double withdraw Amount - Scanner. vert Dash 13	The second secon
account withdrane (with draw 4 manti);	Choose an action
DACAD .	1. Depart
case 5 - System and purtled "Exiting - "); exit = 1; heak; default: SOP ("Invalid"); }	2 Display Balance : 3 Compate Interest (Savings only)
exit = 1; break:	3 Compate Interest (Savings only)
default: SOP ("Invalid"); 3	4: With draw
while (exit ==0);	5 Ent
Scanner clase ();	3 Chair have it market
3	Interest computed and odded: 80.0
	Balance for account number 1001.2080.0
1	

```
Code:
import java.util.Scanner;
class Account {
  protected String customerName;
  protected int accountNumber;
  protected double balance;
  protected String accountType;
  public Account(String customerName, int accountNumber, double balance, String accountType) {
    this.customerName = customerName;
    this.accountNumber = accountNumber;
    this.balance = balance:
    this.accountType = accountType;
  }
  public void deposit(double amount) {
    balance += amount;
    System.out.println("Deposit successful! New balance: " + balance);
  }
  public void displayBalance() {
    System.out.println("Balance for account number " + accountNumber + ": " + balance);
}
class SavAcct extends Account {
  private static final double INTEREST_RATE = 0.04; // Example interest rate of 4%
  public SavAcct(String customerName, int accountNumber, double balance) {
    super(customerName, accountNumber, balance, "Savings");
  }
  public void computeAndDepositInterest() {
    double interest = balance * INTEREST_RATE;
    balance += interest;
    System.out.println("Interest computed and added: " + interest);
    displayBalance();
  public void withdraw(double amount) {
    if (amount <= balance) {
       balance -= amount;
       System.out.println("Withdrawal successful! New balance: " + balance);
       System.out.println("Insufficient balance for withdrawal.");
```

```
class CurAcct extends Account {
  private static final double MINIMUM BALANCE = 500.0;
  private static final double SERVICE_CHARGE = 50.0;
  public CurAcct(String customerName, int accountNumber, double balance) {
    super(customerName, accountNumber, balance, "Current");
  }
  public void checkMinimumBalance() {
    if (balance < MINIMUM BALANCE) {
      balance -= SERVICE_CHARGE;
      System.out.println("Minimum balance not maintained. Service charge imposed: " +
SERVICE_CHARGE);
       displayBalance();
    }
  }
  public void withdraw(double amount) {
    if (amount <= balance) {
      balance -= amount;
      System.out.println("Withdrawal successful! New balance: " + balance);
      checkMinimumBalance();
    } else {
      System.out.println("Insufficient balance for withdrawal.");
  }
public class Bank {
  public static void main(String[] args) {
    Scanner scanner = new Scanner(System.in);
    // Creating savings account
    SavAcct savingsAccount = new SavAcct("Alice", 1001, 1000.0);
    // Creating current account
    CurAcct currentAccount = new CurAcct("Bob", 1002, 800.0);
    // Display account options
    System.out.println("Choose an account type:\n1. Savings Account\n2. Current Account");
    int choice = scanner.nextInt();
    Account selectedAccount = (choice == 1) ? savingsAccount : currentAccount;
```

```
// Menu for actions
    boolean exit = false;
     while (!exit) {
       System.out.println("\nChoose an action:\n1. Deposit\n2. Display Balance\n3. Compute
Interest (Savings only)\n4. Withdraw\n5. Exit");
       int action = scanner.nextInt();
       switch (action) {
         case 1:
            System.out.print("Enter amount to deposit: ");
            double depositAmount = scanner.nextDouble();
            selectedAccount.deposit(depositAmount);
            break;
         case 2:
            selectedAccount.displayBalance();
            break;
         case 3:
            if (selectedAccount instanceof SavAcct) {
              ((SavAcct) selectedAccount).computeAndDepositInterest();
              System.out.println("Interest computation is not applicable for Current Account.");
            break;
         case 4:
            System.out.print("Enter amount to withdraw: ");
            double withdrawAmount = scanner.nextDouble();
            if (selectedAccount instanceof SavAcct) {
              ((SavAcct) selectedAccount).withdraw(withdrawAmount);
            } else if (selectedAccount instanceof CurAcct) {
              ((CurAcct) selectedAccount).withdraw(withdrawAmount);
            break;
         case 5:
            exit = true:
            System.out.println("Thank you for banking with us!");
            break:
         default:
            System.out.println("Invalid choice. Please try again.");
    scanner.close();
  }}
```

Output:

```
C:\JavaProg>java Bank
Name:Anirudh R
USN:1BM23CS036
Choose an account type:
1. Savings Account
Current Account
Choose an action:
1. Deposit
Display Balance
Compute Interest (Savings only)
4. Withdraw
5. Exit
Enter amount to deposit: 1000
Deposit successful! New balance: 2000.0
Choose an action:
1. Deposit
2. Display Balance
Compute Interest (Savings only)
4. Withdraw
5. Exit
Balance for account number 1001: 2000.0
Choose an action:
1. Deposit
Display Balance
Compute Interest (Savings only)
4. Withdraw
5. Exit
Interest computed and added: 80.0
Balance for account number 1001: 2080.0
```

```
Choose an action:
1. Deposit
2. Display Balance
Compute Interest (Savings only)
4. Withdraw
5. Exit
Enter amount to withdraw: 900
Withdrawal successful! New balance: 1180.0
Choose an action:
1. Deposit
2. Display Balance
Compute Interest (Savings only)
4. Withdraw
5. Exit
5
Thank you for banking with us!
```

Program 6 Packages

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has members the "Sh, method how and place to the control to the state of the states of the curried system at place to the state of the curried system at place to the state of the curried system and plantly "Vin" + this word system and plantly "Vin" + this word system and plantly "Senestre" + this come series of the state of the	6) 6% package CIE which has 2 classes -	this . No. = (1 200 TT T():
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Public class Interest entered entered states class Interest entered entered states states class Interest entered entered states attends states of the protected double ciemarks I = new dead scanner of the public void input CIF marks (I) E public void input CIF marks (I) E for (int c=0; ix5; i++) E soft ("Entered entered enter	sementer of the student. Import 2 packages	what days wil Scanner
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protected double ciemarks [] = new double ciem	In sudent in all file courses	Public static class Internal entered wider ?
public dan Study & Scanner & = Neuro Scenner (System in); public void infut CTF marks (1 E for (int c=0; ins ; i++) { Sof ("Enter to cie marks of +(e+1)) Public dan Study }		protected double ciemarks [] = new doublets
Public clan Study 3	package CIE;	Scamer Sc = News Scanner (System in);
Public clan Student &	(1)	public word input CTE marks (1 &
	mpor Java all Samer,	for (ind c=0 , ins , i+)}
protected String usn = nao tring (): protected String name = new string (): protected in Sam: 1	Public class C+ 1.+ 8	Sof ("Enter to ale marks of +(l+1)+
protected string name = new string (): protected string name = new string (): protected in Sam:	one tested Still and the	the subject of
protected in Som.	Oralected (time of the control of th	2 Cilmares LL) = 2 - new vouble ();
PAROLUNI NO SUM.	hidacted and Can	3
public word inject studies Details (1) }	public unid was troloid Datail (1)	3
Scarmen Sc. house Scarmen Chate in	Scorner & hour Scorner (lute in	1
System out print in (" Enter to vano of prihage SEE) Student (n"); this name = Sc. next Line (); many java will Scanner;	System get him to l'Enter the cond	motory SEF 2
System out print on (" Enter the vane of prichage SEE") Student ("); this name = SC. next line (); mport java will scanner;	((widend In')	Ghail CIE. A
thin ramo = SC - next (ino 1); miser some will Scanner	this name = SC - next Line ():	misor 1000 - util Scanner;
Stations, Oak, Mind on 1 F. le the Man 1 Holy	Sustem out point in ("Futer the USA) of White	
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System out print la l'Enter the generate the		
Student is dudying in In ");	Student is studying in In 1);	
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protected double seemants []= now doublets; Protected double final marks[]= now doublets;	
	infort See. * unfort Jain will Scanner,
public resid input SEE mark () & Sames S = new Sames (System in);	class Main 2 PSOM CString args[] 2
So P ("Entr the SEE", marks of " + (i+1)+"h subject "); this seemerholi]: So nevel Double ();	SOP("Nome: HiradhR"); SOP("NSN: 1BM23C5036");
public word define final marks (3) }	SOP (4 Entir to number of Students'); N= SC next Int (); Filternals e C3 = reno E zternals [n]; for (int i=0; Lenji+1)?
for lint i = 0, 125, i++) 3 thin find Manholi = cieonarks lil + c seemarks lil (2.0);	e[i]- reno Externals (); SOP("Firsty the"+(i+1)+"the student details in"); e[i] input student Details (!");
public void displayfinations how &	3 3 Output
System out print lin ("The final mashs of Sudent is In"); for (in) i=0 1 i < 5 , i + +) }	Name: Animoth & USM: 18M23CSQ36 Enter the number of students
SOP (Wies final Marks []);	Enter name of student details Enter name of student amost: Enter to USN of student
3 3 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	1 bm 23c50 to 2. Enter semester 3

1500	
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_	20
-	30
	40
	45
	50
1100	Entre SEE marks
	50 Called Control
	60
	70
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100	Nans: Anady
	Usm: 1 5m 23 C5042
	Seniota 3 The marks of electric is
	45.0
	60.0
	35.0
	95.0
	95.0
	Salar Victoria Small

```
Code:
package CIE;
import java.util.Scanner;
public class Student {
              protected String usn = new String();
              protected String name = new String();
              protected int sem;
              public void inputStudentDetails(){
                      Scanner sc = new Scanner(System.in);
                      System.out.println("Enter the name of the student \n");
                      this.name=sc.nextLine();
                      System.out.println("Enter the USN of the student \n");
                      this.usn=sc.nextLine();
                      System.out.println("Enter the semester the student is studying in \n");
                      this.sem=sc.nextInt();
               }
              public void displayStudentDetails(){
                      System.out.println("Name: " + this.name);
                      System.out.println("USN: " +this.usn);
                      System.out.println("Semester: " +this.sem);
               }
}
package CIE;
import java.util.Scanner;
public class Internals extends Student {
              protected double ciemarks[] = new double[5];
              Scanner sc= new Scanner(System.in);
              public void inputCIEmarks(){
                      for(int i=0; i<5; i++){
                             System.out.println("Enter the CIE marks of"+ (i+1)+"th subject");
                             this.ciemarks[i]= sc.nextDouble();
                      }
               }
}
package SEE;
import CIE.*;
import java.util.Scanner;
public class Externals extends Internals{
                             protected double seemarks[] = new double[5];
                             protected double finalMarks[] = new double[5];
```

```
public void inputSEEmarks() {
                                     Scanner sc = new Scanner(System.in);
                                     for(int i=0; i<5; i++){
                                             System.out.println("Enter the SEE marks of" + (i+1)+"th
subject");
                                             this.seemarks[i]= sc.nextDouble();
                                     }
                              }
                              public void definefinalmarks(){
                                     for(int i=0; i<5; i++){
                                             this.finalMarks[i] = ciemarks[i] + (seemarks[i]/2.0);
                                     }
                              }
                             public void displayfinalmarks(){
                                     System.out.println("The final marks of the student is \n");
                                     for(int i=0; i<5; i++){
                                             System.out.println("The marks of the" + (i+1)+"th
subject is \t");
                                             System.out.println(this.finalMarks[i]);
                              }
}
import SEE.Externals;
import java.util.Scanner;
class Main{
              public static void main(String args[]){
                      int n;
                      Scanner sc = new Scanner(System.in);
                      System.out.println("Name: Anirudh R");
                      System.out.println("USN: 1BM23CS036");
                      System.out.println("Enter the number of students \t");
                      n= sc.nextInt();
                      Externals e[] = new Externals[n];
                      for(int i=0; i< n; i++){
                             e[i] = new Externals();
                              System.out.println("Enter the" +(i+1)+"th student details \n");
                              e[i].inputStudentDetails();
                              System.out.println("Enter the" +(i+1)+"th student's CIE marks\n");
                              e[i].inputCIEmarks();
                              System.out.println("Enter the" +(i+1)+"th student's SEE marks\n");
```

}

```
Microsoft Windows [Version 10.0.22631.4460]
(c) Microsoft Corporation. All rights reserved.
C:\Users\Admin>D:
D:\>cd 1bm23cs036
D:\1bm23cs036>javac Main.java
D:\1bm23cs036>java Main
Name: Anirudh Ŕ
USN: 1BM23CS036
Enter the number of students
2
Enter the1th student details
Enter the name of the student
anoop
Enter the USN of the student
1bm23cs042
Enter the semester the student is studying in
Enter the1th student's CIE marks
Enter the CIE marks of1th subject
Enter the CIE marks of2th subject
Enter the CIE marks of3th subject
Enter the CIE marks of4th subject
Enter the CIE marks of5th subject
Enter the1th student's SEE marks
Enter the SEE marks of1th subject
Enter the SEE marks of2th subject
Enter the SEE marks of3th subject
Enter the SEE marks of4th subject
Enter the SEE marks of5th subject
```

```
The details of the1th student is
Name: anoop
USN: 1bm23cs042
Semester: 3
The final marks of the1th student is
The final marks of the student is
The marks of the1th subject is
45.0
The marks of the2th subject is
60.0
The marks of the3th subject is
75.0
The marks of the4th subject is
The marks of the5th subject is
Enter the2th student details
Enter the name of the student
akul
Enter the USN of the student
1bm23cs023
Enter the semester the student is studying in
Enter the2th student's CIE marks
Enter the CIE marks of1th subject
Enter the CIE marks of2th subject
Enter the CIE marks of3th subject
Enter the CIE marks of4th subject
Enter the CIE marks of5th subject
Enter the2th student's SEE marks
Enter the SEE marks of1th subject
Enter the SEE marks of2th subject
Enter the SEE marks of3th subject
Enter the SEE marks of4th subject
```

Enter the SEE marks of5th subject 90 The details of the2th student is Name: akul USN: 1bm23cs023 Semester: 3 The final marks of the2th student is The final marks of the student is The marks of the1th subject is 45.0 The marks of the2th subject is The marks of the3th subject is The marks of the4th subject is 75.0 The marks of the5th subject is 85.0

Program 7
Exception handling

Dots//_
Page
1 Lab -7
import java util Scanna;
class Wrong age Exception extends Texception ?
int as
public whom Age Freeht on 1 5thing mangal into
public whong Age Exception (5thing mornage, intog)
Suber (memage);
Super (message); this ag = ag;
3
aftern talet i
return "Involid age: " + ag + "In' + getNessage";
noturn "Tourish a in too will it
3 Table of age. Tag + in +getromag();
33
1 -+1 6 CMB: CMB m3 (600)
class Father 3
int fage;
exotected String from = new String ();
boolean att details () }
Scanner Sc: new Scanner (System in);
1- 5
100
Soft" Enter name of father ");
this france - sc. next line ();
20P("Enter age of father");
His last that the
this fage = sc. nont Int ();
if Chot fage 221 1 2
age ! Minimum age of father must be 211h",
ace II Mississis and I than a + 1 - 211 "
this fage),
3
and the second of the second o
Care to the regulation of the colors
April Ac dillown of days & father chould be It.

Date/Page	70	bate
		Page
1 E All takens		
also &	1	else &
SOP Como delas of the factor was	1	SOP ("The details of the son ou");
SOP ("The delails of the father are"); SOP ("Name of the father " + this frame); SOP ("Age of father!" + this face!"; return here;	10 1/4	SOP ("The détails of the sen au"); SOP ("The Name is " of this sname!; SOP ("Age of the sen: " + This sage);
SOP ("Age of father. + 100 gage)		SOP ("Age of the son: " + this sage);
return bue;		3
3		3
3		cotch (Wrom Age Frenhlian e) 2
eatch (WrongAge Exception e) } SOP(e);		catch (Wong Age Exception e) ?
soples,		3 3 3
return false;		The second second
3 ECO polled garde straight		clas Daina 3
Marsh 3 all 4 part Chan behavior paid.		Propose (String and B) &
3 1	1	(a S = (a C);
	1	Ils cost det de la 2
class son extends Father 3		g (3 glas adaily (3) 2
class Son outends Father ? ind sage protected String anome = naw String (); word get details()?	1	class Driver & PSOM (String arga EJ) } Som S = revo Som C); if (S. gelf details ()) & S. geldelath (); }
protected String angue - now String (1:		else 3
word got delated &		SOP ("Falters details are Tourled");
Scores (1 - 100 a Con (1) +		Sol (Fathers allais are mixelist)
Scanner Sc= new Scanner (System in);		0 +1 +
SOP ("Entre Sons Name"):		Output
this one some some since		Enter Name of father
this oname = Sc. northine();		ABC
SOP (4 Entre Son's Age 1);		Into the age of father
Ms. sagl = sc. mont Int();		1 2 2
of C super: fage (this -sage) &	, er	The details of father are Nome 35 ABC
throw new otherna Age Exception (Finter	5	Nome: 35 ABC
a valid age 11 Son' & age cannot be a -1	U8/50	Age: 32
this sage = sc. mont int(); if (super: fage < this -sage) ? throw new intromating Exception ("Entu a valid age ! I son's age cannot be giralle than father age !n", this sage).	100 / 5ª	Enthe name of SON
	1 3	OTT
else if (super fage = this sage <=21) { (throw new Wlong Age Exception (Enter a could	1	Age 29
throw new Whoma Age Front (05		Invalid age.
1 Ac dilles is the free a ould		are the
age! Age different of non & father should be 21%		

```
Code:
import java.util.Scanner;
class WrongAgeExcpetion extends Exception{
int ag;
public WrongAgeExcpetion(String message, int ag){
super(message);
this.ag = ag;
@Override
public String toString(){
return "Invalid age: "+ ag +"\n"+getMessage();
}
class Father{
int fage;
protected String fname = new String();
boolean getfdetails(){
Scanner sc = new Scanner(System.in);
try{
System.out.println("Enter the name of the father");
this.fname = sc.nextLine();
System.out.println("Enter the age of the father");
this.fage = sc.nextInt();
if(this.fage<21){
throw new WrongAgeException("Enter a valid age!! Minimum age of father must be 21 \n",
this.fage);
}
else{
System.out.println("The details of the father are");
System.out.println("Name of the father: "+this.fname);
System.out.println("Age of the father: "+this.fage);
return true;
}
catch (WrongAgeExcpetion e){
System.out.println(e);
return false;
}
class Son extends Father{
int sage;
```

```
protected String sname = new String();
void getsdetails(){
Scanner sc = new Scanner(System.in);
try{
System.out.println("Enter the name of the son");
this.sname = sc.nextLine();
System.out.println("Enter the age of the son");
this.sage = sc.nextInt();
if(super.fage<this.sage){</pre>
throw new WrongAgeException("Enter a valid age!! Son's age cannot be greater than father's age\n",
this.sage);
else if(super.fage-this.sage<=21){
throw new WrongAgeExcpetion("Enter a valid age!! Age difference of son and father must be atleast
21 years!! \n", this.sage);
}
else{
System.out.println("The details of the son are");
System.out.println("Name of the son: "+this.sname);
System.out.println("Age of the son: "+this.sage);
catch (WrongAgeExcpetion e){
System.out.println(e);
}
}
class Driver{
public static void main(String args[]){
Son s = new Son();
if(s.getfdetails()){
s.getsdetails();
}
else{
System.out.println("Father's details are invalid; so you cannot enter son's details \n");
}
}
}
```

```
C:\Anirudh\programs\JavaProg>javac Driver.java
C:\Anirudh\programs\JavaProg>java Driver
Name:Anirudh R
USN:1BM23CS036
Enter the name of the father
Enter the age of the father
The details of the father are
Name of the father: abc
Age of the father: 25
Enter the name of the son
Enter the age of the son
Invalid age: 30
Enter a valid age!! Son's age cannot be greater than father's age
C:\Anirudh\programs\JavaProg>java Driver
Name:Anirudh R
USN:1BM23CS036
Enter the name of the father
Enter the age of the father
The details of the father are
Name of the father: abc
Age of the father: 29
Enter the name of the son
Enter the age of the son
Invalid age: 22
Enter a valid age!! Age difference of son and father must be atleast 21 years!!
```

Program 8

Multithreading

Date	Date// Page
one thread displaying "BMS College one thread displaying "BMS College one thread displaying "SE conce every 2 seconds	(atch (Inturupted Exception e) } Sol (e), } }
public class Thread Example &	public states usoid main (String IJ ago) {
Static class BMS Display Mrad entered Thinss public incid Rum () & while (three) & System out puit of UBrs college of Engineer of	Thread bms Thread = new BMS Display Thread(); Thread coemead = new CSE Display Thread(); brasthread - start(); CSEThread - Start();
Threed Suff (10 000);	3 Output
catch & Intrupted Exception e) { System out priorlin(e); }	BMS College of Engineering
State class CSEDISplayThread anterdy Thread S.	CSE CSE CSE
fortial System and print in lucse up, Try & Trued 'Sleep (2000);	
3	

```
Code:
public class ThreadExample {
   static class BMSDisplayThread extends Thread {
    public void run() {
       while (true) {
         System.out.println("BMS College of Engineering");
         try {
            Thread.sleep(10000);
         } catch (InterruptedException e) {
            System.out.println(e);
       }
  static class CSEDisplayThread extends Thread {
    public void run() {
       while (true) {
         System.out.println("CSE");
         try {
            Thread.sleep(2000);
          } catch (InterruptedException e) {
            System.out.println(e);
       }
  }
  public static void main(String[] args) {
    // Create two threads
    Thread bmsThread = new BMSDisplayThread();
    Thread cseThread = new CSEDisplayThread();
    bmsThread.start();
    cseThread.start();
```

Output

Program 9

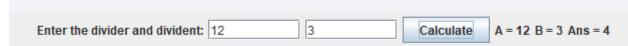
Integer division with user interface

Lab-9
-) Write a program that creates a wiser
interface to perhan integer division. The user enters turo numbers in
The use enter two numbers in
led hields Vinnie and way time
divinion of sum I and Nerm I is displayed
in the Roult field when the divide
bitten is clicked.
Output and hand have
The second of th
Enly the divided and dividend 12 3 Testeular
D=12 B= 3 Am = 4

```
Code:
import javax.swing.*;
import java.awt.*;
import java.awt.event.*;
class SwingDemo{
SwingDemo(){
// create iframe container
JFrame ifrm = new JFrame("Divider App");
jfrm.setSize(275, 150);
jfrm.setLayout(new FlowLayout());
// to terminate on close
jfrm.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
// text label
JLabel jlab = new JLabel("Enter the divider and divident:");
// add text field for both numbers
JTextField aitf = new JTextField(8);
JTextField bitf = new JTextField(8);
// calc button
JButton button = new JButton("Calculate");
// labels
JLabel err = new JLabel();
JLabel alab = new JLabel();
JLabel blab = new JLabel();
JLabel anslab = new JLabel();
// add in order :)
jfrm.add(err); // to display error bois
ifrm.add(jlab);
jfrm.add(ajtf);
ifrm.add(bjtf);
jfrm.add(button);
ifrm.add(alab);
jfrm.add(blab);
ifrm.add(anslab);
ActionListener l = new ActionListener() {
public void actionPerformed(ActionEvent evt) {
System.out.println("Action event from a text field");
}
};
ajtf.addActionListener(l);
bitf.addActionListener(l);
button.addActionListener(new ActionListener() {
public void actionPerformed(ActionEvent evt) {
int a = Integer.parseInt(ajtf.getText());
int b = Integer.parseInt(bitf.getText());
int ans = a/b;
```

```
alab.setText("\nA = " + a);
blab.setText("\nB = " + b);
anslab.setText("\nAns = "+ ans);
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!");
}
});
// display frame
jfrm.setVisible(true);
public static void main(String args[]){
// create frame on event dispatching thread
SwingUtilities.invokeLater(new Runnable(){
public void run(){
new SwingDemo();
});
```

Output



Program 10

Inter process communication and deadlock

Lab-10
Tag land
- Demonstrate inter process Communication
ond deadlock
- Output
- Main Thread enlined A- poo
The same of the sa
Mainthroad truing to call Relaxtes
Mainthread trying to call Blast W. having Thread trying to call A last W
Traviole A. lax
- Geer Back in other Untered
Top Inside A lost
Back in main thread

The process communication. Oesetput: Press control-c Put: O Put Put: 1 Put: Put: 2 Put:	
Put: 0 Put Put: 1 Put: Put: 3 Put:	
Put: 1 Put: Put:	for stop
	12
Put: 3 Put: Put: 1	14
Pat: 5 Cot: 1	
Put: 7 Put: 8	
Put: 9 Put: 10	

```
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++;
}
class PCFixed{
public static void main(String args[]) {
System.out.println("Name:Anirudh");
System.out.println("USN:1BM23CS036");
Q q = new Q();
new Producer(q);
new Consumer(q);
System.out.println("Press Control-C to stop.");
}
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();
}
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();
```

```
}
void last() {
System.out.println("Inside A.last");
}
}
class Deadlock implements Runnable
A a = new A();
B b = new B();
Deadlock() {
Thread.currentThread().setName("MainThread");
Thread t = new Thread(this, "RacingThread");
t.start();
a.foo(b); // 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[]) {
System.out.println("Name:Anirudh");
System.out.println("USN:1BM23CS036");
new Deadlock();
}}
```

Output

C:\Users\Admin\Desktop\1bm23cs042>java Deadlock
Name:Anirudh
USN:1BM23CS036
MainThread entered A.foo
RacingThread entered B.bar
MainThread trying to call B.last()
RacingThread trying to call A.last()
Inside A.last
Back in other thread
Inside A.last
Back in main thread

Press Control-C to stop.
Put: 0

Intimate Consumer

Producer waiting

Got: 0

Intimate Producer

Put: 1

Intimate Consumer

Producer waiting

consumed:0
Got: 1

Intimate Producer

consumed:1
Put: 2

Intimate Consumer

Producer waiting

Got: 2

Name:Anirudh USN:1BM23CS036 Intimate Producer

consumed:2 Put: 3

Intimate Consumer

Producer waiting

Got: 3

Intimate Producer

consumed:3 Put: 4

Intimate Consumer

Producer waiting

Got: 4

Intimate Producer

consumed:4

Put: 5

Intimate Consumer

Producer waiting

Got: 5

Intimate Producer

consumed:5

Put: 6