VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.



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



(Autonomous Institution under VTU)

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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 **Annamsetti Saran Tej (1BM23CS040)**, 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.

Jyothi S Nayak
fessor & HOD
artment of CSE, BMSCE

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Github Link:

https://github.com/Sarantej555/java-lab

Program 1Implement Quadratic Equation

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ter the Coefficient C	

Code:

```
import java.lang.Math;
import java.util.Scanner;
class Quadratic
  int a,b,c;
  double r1,r2,d;
  void calculate()
  {
     if(a==0)
        System.out.println("Not a quadratic equation \n");
     }
     else{
        d=(b*b)-(4*a*c);
     if(d>0)
        System.out.println("Roots are real and distinct \n");
        r1=((-b) + (Math.sqrt(d)))/(double)(2*a);
        r2=((-b) - (Math.sqrt(d)))/(double)(2*a);
        System.out.println("R1= \t^* + r1 + \t^* \);
        System.out.println("R2= t'' + r2 + "n");
     if(d==0)
        System.out.println("Roots are real and equal \n");
        r1=((-b)/(double)(2*a));
        r2=r1;
        System.out.println("R1= \t^{+} + r1 +"\n");
        System.out.println("R2= \t^{"} + r2 + \t^{"});
     if(d<0)
        System.out.println("Roots are distinct and imaginary \n");
        r1=((-b) + (Math.sqrt(-d)))/(double)(2*a);
        r2=((-b) - (Math.sqrt(-d)))/(double)(2*a);
        System.out.println("R1= t'' + r1 + i'n'');
        System.out.println("R2= \t^* + r2 + \t^*);
     }
  }
}
class Run{
  public static void main(String args[])
```

```
Quadratic Q= new Quadratic();
System.out.println("Enter the value of a, b and c \n");
Scanner sc = new Scanner(System.in);
Q.a=sc.nextInt();
Q.b=sc.nextInt();
Q.c=sc.nextInt();
Q.calculate();
}
```

Output:

```
C:\Users\Admin\Downloads>java Run
Enter the value of a, b and c

3
3
4
Roots are distinct and imaginary
R1= 0.5408329997330664i
R2= -1.5408329997330663i
```

Program 2 SGPA Calculator

The state of the s	DATE: PAGE:
SGPA so her set withous wife	
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import java util scanner; Class Stud details?	int gripping -0;
1.4001	int openford = 0; is a region to the line of the line
int monks[] = new int[8];	So Cint 1=0, 111 111 11
int credit = new intist.	" a = monks (5) /10;
String name, 7150;	160000000000000000000000000000000000000
double sgpa; Scanner Sc= new Scanner(Systemin);	Campata + (14 Scotter a) 4 112
Scorner SC - Hell Otto	Case 10: ordaint 10; break,
Unid a talaba illat Va	Case 10: grapaint = 10; break;
Void getdetails() & System ord println ("Enter the USN");	Case 8: Marting will all
USN = SC. Newt(); System out println ("Enter the name");	
quetom-out printly ("Enter the name")	Cose 7 Chelph Die
name = Schoot(2); for (int i=0; ic8: i+1)?	
for (int i=0: i28: i+1)?	Grave 4: opational=20+1; broak;
System out pointed ("Enter the mines"	Cose 3:
masker of - SCINO FINE	Case ?!
System out println ("Enter the Greater"	Cose 1: System out privalnt "Fail");
Oud (i) = SC neat Int();	
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1 (2001 2831 -1001 VISTALL MINUSPE VI	7.
9	Sud an out pointly (NOW).
11011 1101 00 0	System out printly (30m): this sypa = Sum 200;
void display () (Mrs. Stra - ourit to s
	3
System.out.println ("USN"+" + USN);	9
System out print ("rame" + " "+ name). System out print ("sypa" + this sapa);	
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DATE: Class Students 9 Public static void main (string 2008/1)5 Stud-details 81(7 - new stud-details ST (int j=0; jc3; j++)s

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\$1 (j) . getdetaul();

\$1 (j) . calcs(SPAC); 63 Clut j=0; j(3; j +1)(· CHOP william to mo to

```
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();
}
}
```

```
C:\Users\Dmsce\DownLoads>Java Student
Enter the details of 1 Student
Enter the USN
40
Enter the name
saran
Enter the mark
90
Enter the credit
4
Enter the mark
80
Enter the credit
4
Enter the credit
3
Enter the mark
80
Enter the credit
3
Enter the mark
80
Enter the mark
```

```
Enter the mark
Enter the credit
Enter the mark
Enter the credit
Enter the mark
80
Enter the credit
Enter the mark
80
Enter the credit
191
```

```
curer rue creatr
Enter the mark
78
Enter the credit
Enter the mark
Enter the credit
Enter the mark
90
Enter the credit
169
usn 40
name saran
SGPA is9.55
usn 42
name anoop
SGPA is5.95
usn 14
name abhi
SGPA is8.45
```

Program 3

Book Program

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		2019			
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	1100	withol = sc next	2) TAV and		
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	Suctemon	ut println ("Nam	" + name+ " In	Authol: "	+ author
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Class BookDemo &
class Book Demo &
class Book Demo & public static void main (String ang []) & public static void main (String ang []) &
Scanner Sc = new Scanner (System in)
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Scanner Sc = new Scanner Systems System out print ("Swan 1bm2368040") System out print ("Enter the number of books: ") int book Num = Sc next Int();
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Book book Amay] = new Book [book Nevm]
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System out print ln(); +00 months
3 Continue Amora 22 = 201 A1 2017
for(int i=0; ic bookstum; i++) ?
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Enter the number of books:
3 'sotry to song at " + Loppey_mus"
Enter Name: the wings of five Enter Author: APJ-Abdul-Kalam
Eta Chan 200
Enter Pages: 200
Enter Pric: 987

```
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("Saran 1bm23cs040");
     System.out.println("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();
}</pre>

Saran 1bm23cs040Enter the number of books

Enter Name:the_wings_of_fire
```

}

```
Saran 1bm23cs040Enter the number of books:

3
Enter Name:the_wings_of_fire
Enter Author:APJ_Abdul_kalam
Enter Pages:200
Enter Price:453

Enter Name:Geronimo_Stilton
Enter Author:dami
Enter Pages:345
Enter Price:543

Enter Name:the_lord_of_rings
Enter Author:john_ronald
Enter Pages:345
Enter Price:987

Name: the_wings_of_fire
Author: APJ_Abdul_kalam
Pages: 200
Price: 453.0

Name: Geronimo_Stilton
Author: dami
Pages: 345
Price: 543.0
```

```
Name: the_wings_of_fire
Author: APJ_Abdul_kalam
Pages: 200
Price: 453.0
Name: Geronimo_Stilton
Author: dami
Pages: 345
Price: 543.0
Name: the_lord_of_rings
Author: john_ronald
Pages: 345
Price: 987.0
```

Program 4
Abstract Class shape program

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Lab-4	TOP TO THE STATE OF THE STATE O
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import java-ntil. Scanner;	class and catands shapes are supplied as the same
abstract class Shape &	double to
double a;	Cincle Course 1
double by	dauble 1) E circle (double 1) E this rest
double b; abstract void printArea();	void print Arrache System out println (The area of the Circle 1: " + rer)
	Suction out winter C. The arica of the white
9 on a metande Shaped	+ rir);
class Rectangle crotends Shape &	3
double l;	3
double br;	3 2 2 5
Rectangle Couble a double b) &	Class Shape Demo & public static vaid main (string ang TT) & System and printly ("soman "bom 18 (2040");
le=a;	probat section wintly ("savan Ulbm 18 (6040))
br=b;	System out print (switch (215)) Rectangle r = rew Rectangle (215); Rectangle r = rew Triangle (215)
3	Rectangle t = new riangle Cur) Triangle t = new riangle Cur)
void printArea() & Outer Area of the rectangly is	and c nu condes
custom out mother "The Area of the rectally is.	and
+ l*br);	
void printArea() { System.out.println ("The Area of the rectangle is + l + br);	r privid Arca();
1 3	· post A Aroad !
9	(print Area();
class Triangle contends Shape &	1
Lable b	
double h;	3
double by	
Triangle Cdouble a, double 6)	
han:	
this, b = b;	
trus, D = 0,	
3	
void print Area CDS	
System-only-println("The Area of the Rectargle is: " (h+b)/2-0);	
System out minten the rived of	
Portante in " (hth 1/2-0);	

```
import java.util.Scanner;
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 Triangle 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: "+ r*r);
class ShapeDemo{
        public static void main(String args[]){
         System.out.println("saran 1bm23cs040");
                 Rectangle r = new Rectangle(2,5);
                 Triangle t = new Triangle(2,5);
                 Circle c = new Circle(5);
                 r.printArea();
                 t.printArea();
                 c.printArea();
}
```

C:\Users\bmsce\Downloads\cs040>java ShapeDemo The Area of the rectangle is: 10.0 The Area of the Rectangle is: 5.0 The area of the Circle is: 25.0

Program 5
Bank program

DATE: PAC:	DATE: PAGE:
SOM THE CONTRACTOR OF THE CONT	Service of the servic
Lab-S	Upid Interest () & boulance + interest Role;
Banking:	double indeest = bausine
	balance + = indexet New balance: "+ balance)
Import java retil scanner	double Indeest = balance + interest rate balance + indeest cided. New balance : "+ balance) S-0-p (" Indoest cided. New balance : "+ balance)
	i ci il mand) sur mane.
abstract class Account?	bolano >= amount) (
int account Number	bularre = amount
lut account Number;	Void with draw (drawle drawn) ! bulance = amount Successful Nuce bulance; " + tolave); S.o. p. ("withdraw Successful Nuce bulance; " + tolave);
String accountly pe	S. O. P. ("Withdraw Succession" 1942 8 S class 1 Supplied before:) jung 10 10 10 10 10 10 10 10 10 10 10 10 10
acting states of	S. D. P. "I way ficked belon (e.)
Account (String Customer Name, ind account Number,	· U un = buscoso macosa
String account type, double balanches	6/1== 91(0/1) 4
String account with a constant frame;	3 Comment of the south of the s
this account number = account number	Class Carted extends Account
this accounting = account type; this balance = balance;	Class Curticit extends Accountil double minibalalance 1000 00
ctus balance = balane;	double minibalance according to the double final.
3 05 11 5 14 11	doublet charaction = readantoftoal;
Q 11 N	int checking = 0.
Void display()(
S. O. P.C Balance: " + balance)	Super (Customer Nave, account Nouthber, barlance);
2	Super Continuer in
abstract void interest ()! abstract void withdraw (double amunal):	CO-RO WI
abstract void withdraw (double amurut)	According to the second of the
5 12 / 1 2 1	Void interest() { SO-P("Interest Cannol be calculated");
Class Sav Acad epolents Accounts	Sort substitution of the s
double interest Role = 0 ag	1 1. A. Francischior () ()
Sav Part C String Customer Nano, into accountly what	Void display fransaction () [Joseph Transaction () [S.O. P ("Transaction" + (1+1) -1" 1" 1" 1" 1" 1" 1" 1" 1" 1" 1" 1" 1" 1
or a comparation of the comparat	The the order lander
Super (CustomerName, acon munder "Savina" haboure).	S.O. P ("Trangaction of the

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DATE: PAGE	DATE: PAGE:
Public class Bank () public static void note (third I arge) this work scanner as scanner as scanner as scanner and	Gee! S. O. P. ("criter deposit amount"); double deposit Amount = Scanner root double! account deposit (deposit Amount);
Public Class Bank Ch man (thing) age)	Gee! 8.0.P (cheen do post) - Scannel next doubles)
Scanner - New Scanner Congress of	account deposit Amount - Scanner room
S.O. P. ("Ento account types)	1
but choice = Scanner reasons with the blow	account = display();
Scannon (11) over 11 in 11	Cose 1 accide = 2) () and towardian ().
S. O. P. " ("Me casione")	Cose ? account = display(); (Choice = = 2); (Court Acct agount) display Harrachian (), break;
String name = Scarring	hacele.
1 nt account Scanner real Ind (?)	Samuel Alaman &
1 Nt account 2	cose 3: account-Indust ()
Account occount = null;	Cose 3: account-Intrest ()
account - new south coll name, account, balance).	144 1 1 1 1 1 1 1 1 1
account = new sound coll name, account, bounter.	double will-drawayen scanner port Double ;
	double witedrawament scarres from the account witedraw (witedraw through), break; Cose J: S. D.P ("Coulting-")
1) I as a COT ACCT COUNT, HECKING, HOUSE	orcal;
	C. T. S. D.P ("exiting-") jumes to association
else ? 8.0-P("Invalid account type Scheckion")-A reluvin;	cnit =
8.0-P("Truolid account type schoon?	craft = 1 break; war mund and both forms
2	default 8.0.P ("Invalid option");
int cattering	S.O.P. Walla Office.
3 Otropostal Glov	9
(do Cyling of man months 1102	white (exit==0);
S.O.P ("talor the function to be done")	Scanny close();
SO-PC 1. Deposit In 2. Diplay in 3.	OCUPIE)
S.O.P. ("1. Deposit in 2. Display in 3. iompute & acrosit invest in hi withdraw in service in 1. S. evit In")	7
Signature 103	
int option = Scanner-next Intel	

Code:

```
import java.util.Scanner;
class Account {
  private String custName;
  private String accNo;
  private double balance;
  public Account(String custName, String accNo, double balance) {
     this.custName = custName:
     this.accNo = accNo;
     this.balance = balance;
  public double getBalance() {
     return this.balance;
  public void deposit(double amount) {
     if (amount > 0) {
       this.balance += amount;
       System.out.println("The current balance is " + this.balance);
       System.out.println("Amount should not be negative");
  }
  public void withdraw(double amount) {
     if (amount > 0 && (balance - amount) >= 0) {
       this.balance -= amount;
       System.out.println("Withdraw successful. Current balance: " + this.balance);
       System.out.println("Withdraw is not possible");
  }
}
class SavingsAccount {
  private double interestRate;
  private Account account;
  public SavingsAccount(String custName, String accNo, double balance, double interestRate) {
     this.interestRate = interestRate;
     this.account = new Account(custName, accNo, balance);
  }
  public void addInterest() {
     double interest = account.getBalance() * this.interestRate;
     account.deposit(interest);
  }
```

```
public Account getAccount() {
     return account;
  }
}
class CurrentAccount {
  private double minBalance;
  private Account account;
  public CurrentAccount(String custName, String accNo, double balance, double minBalance) {
     this.minBalance = minBalance;
     this.account = new Account(custName, accNo, balance);
  }
  public void withdraw(double amt) {
     if (amt > 0 && (account.getBalance() - amt) >= minBalance) {
       account.withdraw(amt);
     } else {
       System.out.println("Withdraw is not possible");
  public Account getAccount() {
     return account;
  }
}
public class Bank {
  public static void main(String[] args) {
     Scanner sc = new Scanner(System.in);
     System.out.println("Enter the name:");
     String name = sc.nextLine();
     System.out.println("Enter the account number:");
    String accnt = sc.nextLine();
     while (true) {
       System.out.println("Enter your choice:");
       System.out.println("1. Savings Account");
       System.out.println("2. Current Account");
       System.out.println("3. Exit");
       int choice = sc.nextInt();
       switch (choice) {
         case 1:
            System.out.println("Enter initial balance:");
            double savingsBalance = sc.nextDouble();
            System.out.println("Enter the interest rate:");
            double interestRate = sc.nextDouble();
            SavingsAccount savingsAccount = new SavingsAccount(name, accnt, savingsBalance, interestRate);
            savingsAccount.addInterest();
            break:
```

```
case 2:
          System.out.println("Enter initial balance:");
         double currentBalance = sc.nextDouble();
         System.out.println("Enter minimum balance:");
         double minBalance = sc.nextDouble();
         CurrentAccount currentAccount = new CurrentAccount(name, accnt, currentBalance, minBalance);
         System.out.println("entr the amount to be withdraw");
         double q = sc.nextInt();
         currentAccount.withdraw(q);
         System.out.println("Account created. Current balance: " + currentAccount.getAccount().getBalance());
         break;
       case 3:
         System.out.println("Exiting...");
         sc.close();
         return;
       default:
         System.out.println("Invalid choice. Please try again.");
  }
}
```

Output:

```
Enter the account number:
987653
Enter your choice:
1. Savings Account
2. Current Account
Exit
1
Enter initial balance:
456
Enter the interest rate:
The current balance is 3648.0
Enter your choice:
1. Savings Account
2. Current Account
Exit
Enter initial balance:
456
Enter minimum balance:
entr the amount to be withdraw
654
Withdraw is not possible
Account created, Current balance: 456.0
Enter your choice:
1. Savings Account
2. Current Account
3. Exit
```

Program 6 Packages

DATE: PAGE:
DATE: PAGE.
Create a package CTE which has two classes students and Internals. The class Students has members like USN, and Internals. The class Students has members like USN, name, sem, The class Internals derived from student has has an armay that stores the internal marks socied in has an armay that stores the internal marks socied in five courses of the Coverent sempster of the Student. Create another package Ste which has the class Enternal which
five Courses of the Coverent semister of the class Enternal which another package SEE which has the class Enternal which is donaid class of Shahil This class has an array that States the SEE marks sold in five courses of the Carray Semester of the Shalout Import the two packages in a file that doctory the final marks of n Studies in all five courses.
Package CIE; (moz man, red) roque
public class Student Sans borretal salend lonewis sull protected string name rates. In 19th studies protected in seminal lossesti arms:
Public Student (String USN, String name, int sem) &
this usn = usn;
this. Sam = Semont = 1 bother
public string getname() & return name;
3
public string systusn() { relian USN;
3

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Public int get sent? Packag CIE; Packag Ci	DATE: PAGE	nate PAGE
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Package City Proble Class Taterals Calculated Student of Package Class Taterals Calculated Calcula	3 2 00 00 00 000 000 000 000	3/244 13 341 341
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let total = 0; let a server total; for (int more); let a server total; for (int more); let a server total; talout + = Mark; let a server total; return total; mark let a server total; return tot	Publication Their Their	total + = Most.
tated 4 = Mark; no die! Tretion total mark and in the season of the sea	1.1 (1.1. and Internal Total) (1.31)	
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retion total course and complet jour actil scanner. Class Main f public state Void model string coges [3] f int p Scanner SC = newscanner (Septem in); Scanner A. Jarout g');	tatoul + = Mark; no dat	1
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C.D.P ("Name, A-Jarouty")	9 0.130 1.165 Super	
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501		C.M.D (Name: A- Sarouty)
C n D (1000) 10 M2 CCCCCC)		S.O.D (11811-12 MAZSOUP)

n = sc next sut)

Enternals P[] = new enternal(n];

for (int i=0; icn, i++) (

e[i] = new External(n];

S.o.p. ("Exter the "+ (i+i) + "the stand soluble Int)

Ci) input strated Details();

co.p. ("Futor the "+ (i+i) + "the stands (strated);

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S.o.p. ("The final markst);

S.o.p. ("The final markst);

C(i) display inclinated;

(Ci) display inclinated;

3

```
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[]){
                                         Scanner sc = new Scanner(System.in);
                                         System.out.println("Name: saran tej");
                                         System.out.println("USN: 1BM23CS040");
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");
                                                       e[i].inputSEEmarks();
                                                       System.out.println("The details of the" +(i+1)+"th student is"); e[i].displayStudentDetails();
                                                       e[i].definefinalmarks();
System.out.println("The final marks of the" +(i+1)+"th student is");
                                                       e[i].displayfinalmarks();
                                         }
                           }
}
```

```
Name: saran tej
USN: 1BM23CS040
Enter the number of students
Enter the1th student details
Enter the name of the student
anoopa
Enter the USN of the student
642
Enter the semester the student is studying in
Enter the1th student's CIE marks
Enter the CIE marks of1th subject
16
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: anoopa
USN: 042
Semester: 3
The final marks of the1th student is
The final marks of the student is
The marks of the1th subject is
The marks of the2th subject is
31.0
The marks of the3th subject is
31.0
The marks of the4th subject is
31.0
The marks of the5th subject is
31.0
Enter the2th student details
Enter the name of the student
anirudh
Enter the USN of the student
036
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
50
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
100
Enter the SEE marks of5th subject
100
The details of the2th student is
Name: anirudh
USN: 036
USM: 036
Semester: 3
The final marks of the2th student is
The final marks of the student is
The marks of the1th subject is
The marks of the2th subject is 100.0
```

The marks of the3th subject is

The marks of the4th subject is

100.0

Program 7
Exception handling

-	
	LAB-7 Plans of the color
	import irwa util. Scaper.
	Closes Vilnera Age Facertion entendy traceptions.
	Public Word Age Exception (String message of
	Supor (hile stage);
	2 Constitution of the cons
	Class Son Age Eaception (String message)
	Super (mossage)
	7
	3 - Outhor 38 = grantas tur
	class Falture (12504 2408 2 103) 3 11 14 012.
	private interest of the hours of the
	a like fitter (and any) thrown wrong the Exercitions
	public father (md cax) throws wrong by tocoptions
	throw m (2) Ind Trong on a Face of an (" Who of age")
	throw new Working Exception (" Wrong age")
	this are - paid without emily into
	this age = ories with some and hotel
	Public int gettige() &
	return a genotion of small state of the stat
	G (16 08 6 6 0 10 0 5 5) 1 0 1 0 5
	4
	class Son entends father &
	private in SonAge! I into
	public Son (int father Age, in son Age) throws Wrong Age Ed
	Son Age Facephons
	Super (fallwigge)
	if (SonAge >= YathwiAge) &
	throw new son Age Facephon (1) sons age Connot be greated
	of equal to Ofathir's afe");
	No. of the second secon
11 19 19 19	

	this son the = son the;
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-	proble Int getson Age () Tetwin · son Age;
	Potent Sontige
	?
	3
	public class father Sont public static void main (8 brings) angs) &
	public Satic void main (864)
	while (1) d
	C = NOIN SCATT COLOR
	m n / m all talles
	int father ye = Sc. road Ind);
	Son Son = now surrellation of our first
	S.O.P ('Accepted buccesfully");
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	S.o.d (c.getnessage);
	Catch Carrons Exampliance &
	S.o.p (e. getness aget))
	1
	Sextensed as 10 City 11 10
	Stemoul pinth ("would you like to re enten details (y(n)");
11	re Endon details (4/m)")
Cotypus.3	String input = SC- nants.
	if input equal in I gno (ase ("n")) s
	Justice and Displace ("n"))
	break, Controlled and
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1 6	comp so humb as the many case former be a fire
1	5° Company and many
	1 College Val. Jamas
24339	

```
import java.util.Scanner;
class WrongAgeException extends Exception {
  public WrongAgeException(String message) {
     super(message);
  }
}
class SonAgeException extends Exception {
  public SonAgeException(String message) {
     super(message);
  }
}
class Father {
  private int age;
  public Father(int age) throws WrongAgeException {
     if (age < 0) {
       throw new WrongAgeException("Wrong age");
     this.age = age;
  public int getAge() {
     return age;
class Son extends Father {
  private int sonAge;
  public Son(int fatherAge, int sonAge) throws WrongAgeException, SonAgeException {
     super(fatherAge);
     if (sonAge >= fatherAge) {
       throw new SonAgeException("Son's age cannot be greater than or equal to father's age");
     this.sonAge = sonAge;
  public int getSonAge() {
     return sonAge;
  }
}
public class FatherSon{
  public static void main(String[] args) {
     while(true){
       Scanner sc = new Scanner(System.in);
       System.out.print("Enter Father's Age: ");
       int fatherAge = sc.nextInt();
       System.out.print("Enter Son's Age: ");
       int sonAge = sc.nextInt();
       try {
         Son son = new Son(fatherAge, sonAge);
```

```
System.out.println("Accepted Succesfully");
}
catch (WrongAgeException e) {
    System.out.println(e.getMessage());
}
catch (SonAgeException e) {
    System.out.println(e.getMessage());
}
System.out.println("Would you like to re-enter details (Y/n)");
String input = sc.next();
if (input.equalsIgnoreCase("n")) {
    break;
}
}
}
```

Output

```
C:\Users\Admin>cd downloads

C:\Users\Admin\Downloads>javac Fatherson.java

C:\Users\Admin\Downloads>java FatherSon

Enter Father's Age: 43

Enter Son's Age: 3

Accepted Succesfully

Would you like to re-enter details (Y/n)

y

Enter Father's Age: 3

Enter Son's Age: 34

Son's age cannot be greater than or equal to father's age

Would you like to re-enter details (Y/n)
```

Program 8

Multithreading

Algorithm

SOAS STAD
Lab-8
Thoreads:
class BMS calends florand?
Public void runc)
coule (true) 5 00 0 1 12 MS College of Freynon
try (cohile (true) & cohile (true) & System and prinkled "BMS College of Engineer Twocod Sleep (10000);
TWood Sleep 1000
Catch (Tuleruppted e) &)
3
3
Class CSE cratends Thouard of
public void run(){
try coli le Ctrue) 2
System. out. printin ("(SE");
Thread-Sleep (2000);
mend-sale (2000)
4
Catch CInterrupted Enterption e) & 3
3
3
Pulolic class Multithopading &
public Static void man (String [] orgs) 5
Birds Ding = new Blads ()
IST (se = new csec).
bms. start().
(se. stood-C)

Code:

```
class BMS extends Thread {
  public void run() {
    try {
       while (true) {
         System.out.println("BMS College of Engineering");
         Thread.sleep(10000); // Sleep for 10 seconds
     }catch (InterruptedException e) {}
  }
}
class CSE extends Thread {
  public void run() {
    try {
       while (true) {
         System.out.println("CSE");
         Thread.sleep(2000); // Sleep for 2 seconds
     }catch (InterruptedException e) {}
}
public class Multithreading{
  public static void main(String[] args) {
    System.out.println("saran tej 1BMCS23CS040");
    BMS bms = new BMS();
    CSE cse = new CSE();
    bms.start();
    cse.start();
  }
```

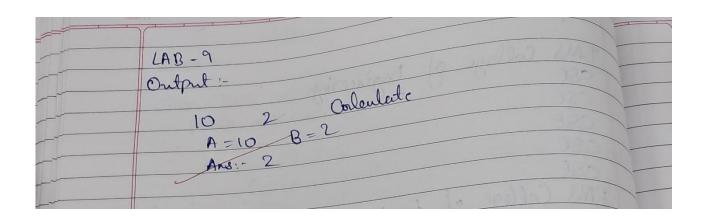
output

```
saran tej 1BMCS23CS040
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
CSE
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BMS College of Engineering
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CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
```

Program 9

Integer division with user interface

Algorithm



```
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
ifrm.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(ilab);
ifrm.add(ajtf);
jfrm.add(bjtf);
ifrm.add(button);
ifrm.add(alab);
ifrm.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) {
try{
int a = Integer.parseInt(ajtf.getText());
int b = Integer.parseInt(bjtf.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
            Enter the divider and divident: 12
                                                                                    A = 12 B = 3 Ans = 4
                                                       3
                                                                        Calculate
```

Program 10

Inter process communication and deadlock

Algorithm

_~		
	things in the state of the stat	
	LAB-10	
	Oulpil:	
	Racing Twocad entered B. bal.	
_~	Maintread entered A foo 1 A level	373
	Racing Thomas trying to Call	
	Racing Thread entered B. Daniel Maintread entered Afoo Racing Thread trying to Call A lengt) Theire A last	
~	Back in other thread	
- GC	Mainthread trying to Call Blass	
12/4	Mainthread trying to Call Blast() Twide A last	
	Back in main torread	
3	/	

Inter process Output process Put to Put 1 Put 2 Put 2 Put 5		put: 11 put: 12 put: 13 put: 13 put: 14			
Put o Put 1 Put 1 Put 1 Put 1 Put 1	Control	put: 11 put: 12 put: 13 put: 13 put: 14			
Put o Put 1 Put 1 Put 2 Put 2 Put 4		put: 11 put: 12 put: 13 put: 14 Got: 14			
Put o Put 1 Put 1 Put 2 Put 2 Put 4		put: 11 put: 12 put: 13 put: 14 Got: 14			
put: 2 pul: 3 put: 4		p. 1. 13 p. 1. 14 Got: 14			
pul: }		got:14			
put:4		Got 14			
		Got:14			
put: 7					
put. 8		•			1
put:9		•			1
put: 10					-
					1
	1. &				-
	N	24			
	41				
					T. I
	put: 6 put: 7	put: 6 put: 7 put: 9 put: 9	put: 6 put: 7 put: 7 put: 9	put: 6 put: 7 put: 9 put: 9 put: 10	put: 6 put: 7 put: 9 put: 9

```
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 = \text{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[]) {
new Deadlock();
}}
```

Output

```
C:\Users\Admin\Downloads>java Deadlock
RacingThread entered B.bar
MainThread entered A.foo
RacingThread trying to call A.last()
Inside A.last
Back in other thread
MainThread trying to call B.last()
Inside A.last
Back in other 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
```

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