## 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



B.M.S. COLLEGE OF ENGINEERING
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## **B.M.S.** College of Engineering,

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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 **Ikshitha P (1BM23CS118)**, who is a 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/Ikshitha-P/Java-lab-programs

#### Program 1

Implement Quadratic Equation

```
6) Develop Java program ito print au vieal solutions its quadratic equation ax +bx + c . Read a,b, c use
    formula and display appropriate memage.
   umport java. util. Scanner;
   import java . dang . Math;
   clan quadratic ?
   un a,b,c;
   double 911, 42;
   void gety ()
   Scanner sc= new Scanner (System. in);
   System. out printer ("Enter Value of a: ");
    a = Sc. new Ins();
     while (a==0)
     System. our. prints ("a value must best be zuro. Timput
                            Value again ");
      a = Sc. newIn();
    System. ow . printer ("Enter value of b:");
    b=sc-newInv();
   System. Ou . perinten ("Enter c value: ");
    C = SC. Next Int ();
  void compute ()
    ilas d= b"b - 4"a"c;
    u (d==0)
     U11 = (-6)/(2*0);
     System. ou . penintin ("Root are real and equal The item Hoot are: "+ 441);
```

```
DATE:
 che 3 (0 -0)
  41 = ((-6) - Math , sqrt (d))) / (double) (2*a) -
   042 = ((-b) + Math squt (d))) / (double) (2*a);
   System. our printle ("Root are wear and distince");
   System Out . prunten (" Root 1: "+1412+ " Root 2: "+ 1412);
 ene if (dco)
  System. our . printh ("Roots are umaginary")
  solouble umag = Main squ (-d) / (2*a);
  System. Ow. previter ("Root 1: 1/. af: ", Hal, mag)
  System - Ow printle ("Root 2: 1. 25 1. 25", veal imag)
public static vord mais (Staing aug. 11)
  Quadratic s= new Quadratic();
  s-gerf ();
  S. compute ();
  System our puints to
Output 1:
              Enter a value 3 4
               ENTER D Value: -4
               Enity c value : 1
               Roots are read and equal
               Root 1:0,5 and Root 2:0.5
```

```
Code:
import java.util.Scanner;
import java.lang.Math;
class Quadratic {
double a,b,c;
double r1,r2;
void getf()
Scanner sc=new Scanner(System.in);
System.out.println("Enter a value:");
a=sc.nextInt();
while(a==0)
System.out.println("a cannot be zero, enter A value again:");
a=sc.nextInt();
System.out.println("Enter b value:");
b=sc.nextInt();
System.out.println("Enter c value:");
c=sc.nextInt();
void compute()
double d=b*b-4*a*c;
if(d==0)
r1=(-b)/(2*a);
System.out.println("Roots are real and equal");
System.out.println("Root 1:"+r1+" and Root 2:"+r1);
else if(d>0)
r1 = ((-b) - (Math.sqrt(d)))/(double)(2*a);
r2=((-b) + (Math.sqrt(d)))/(double)(2*a);
System.out.println("Roots are real and distinct");
System.out.println("Root 1:"+r1+" and Root 2:"+r2);
else if(d<0)
double realPart = -b / (2 * a);
       double imaginaryPart = Math.sqrt(-d) / (2 * a);
```

```
System.out.println("Roots are imaginary: " + realPart + " + " + imaginaryPart + "i");
System.out.println("Roots are imaginary: " + realPart + " - " + imaginaryPart + "i");
}
public static void main(String args[])
{
Quadratic s=new Quadratic();
s.getf();
s.compute();
System.out.println("Name:Ikshitha");

System.out.println("USN:118");
}
}
```

```
D:\1BM23CS118>java Quadratic.java
Enter a value:
4
Enter b value:
-4
Enter c value:
1
Roots are real and equal
Root 1:0.5 and Root 2:0.5
Name:Ikshitha
USN:118
```

```
D:\1BM23CS118>java Quadratic.java
Enter a value:
1
Enter b value:
3
Enter c value:
2
Roots are real and distinct
Root 1:-2.0 and Root 2:-1.0
Name:Ikshitha
USN:118
```

Java program to create a class Student with members usn,name, an array credits and an array marks. Include methods to accept and display details and a method to calculate SGPA of a student.

Algorit	Algorithm:			
	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			
7	Develop a Java program to create a class Student with members usn, name, array create and array			
- 100	and method to calculate SUPA of Student.			
	unport java.util. Scanner;			
and a	dan Subject &			
	unt marks:			
Q P	unt grade;			
94	voi d' calculate quade () {			
- 3	grade = marks 10 +1 ;			
	ig (grade 710)			
	grade=10;			
	else ij (grade < 4)			
	grade=0;			
	3			
	3 tour how have you don't			
	class Student &			
	String name;			
	String usn;			
	double sgpa;			

```
PAGE NO:
                                DATE :
 Subject subject!
  Scanney sc -
  Student ()
    Subject = new Subject [6];
    for (un) (=0; [23; [++)
       Subject [i] = new Subject ();
    Sc= new Scanner (Syum us);
 3 (Juliated Server
      System . out - privite ("Enter name :"
       System out pounts ("Enter Usiv:")
       Usn = Sc-next Line ();
 Void getmanks () {
      for (unt i=0; i48; i++)
         System out. priviles ("Enter marker:
          Subject [1]. Crediti = Sc. nextal):
          Subject [i] . calculate grade (
() oggsetugmes biev
   anstotal marks = 0;
Jor (un te o ; tet) & subject [i] made * subject [i] evedit
                               . credin
  Saper = totalmanks/totalchedits;
```

	PAGE NO: DATE:
	Public Statte void main (String auguss)
	Student St = new Student ()
4	S1-getdetails();
	S1 · get marks ();
	St. computesgpa();
	System ow printer ('Name:', + si-name);
E P	System. out. printer ('VSN:', +SI.Usn);
	System. Out. prunter ('SGPA: + Sz. sgpa);
	2 Chlistote 100 tolor
	5 man wind") attawa two walus
	Ola P. S. T. J. S. C.
	Output: Enter name: Ikshitha
	Enten USN: 1BM23CS118
	Enter marks: 91
	Entre voditi: 4
-	Enter marky: 90
	Enter crodits: 3
	Enter marks: 80
	Enter Gredit : 2
	Name: Ikshilna
	USN: 1BH23CS118
	S CMPA: 9.77
	W. Lu
	1

#### Code:

```
import java.util.Scanner;
class Subject {
  int marks;
  int credits;
  int grade;
   void calculateGrade() {
    grade=marks/10+1;
    if(grade>10)
    grade=10;
    else if(grade<4)
   grade=0:
class Student {
  String name;
  String usn;
  double sgpa;
  Subject subject[];
  Scanner s;
  Student() {
     subject = new Subject[8];
     for (int i = 0; i < 8; i++) {
       subject[i] = new Subject(); // create array of Subject objects
     s = new Scanner(System.in);
  void getStudentDetails() {
     System.out.print("Enter name: ");
     name = s.nextLine();
     System.out.print("Enter USN: ");
     usn = s.nextLine();
   void getMarks() {
     for (int i = 0; i < 8; i++) {
       System.out.print("Enter marks for Subject " + (i + 1) + ": ");
       subject[i].marks = s.nextInt();
       System.out.print("Enter credits for Subject " + (i + 1) + ": ");
       subject[i].credits = s.nextInt();
```

```
subject[i].calculateGrade();
}
  void computeSGPA() {
  double totalGradePoints = 0;
  double totalCredits = 0;
  for (int i = 0; i < 8; i++) {
     totalGradePoints += subject[i].grade * subject[i].credits;
     totalCredits += subject[i].credits;
  sgpa=totalGradePoints/totalCredits;
  }
public static void main(String args[]) {
  Student s1 = new Student();
  s1.getStudentDetails();
  s1.getMarks();
  s1.computeSGPA();
  System.out.println("Name: " + s1.name);
  System.out.println("USN: " + s1.usn);
  System.out.printf("SGPA: %.2f\n", s1.sgpa);
```

```
Enter name: Ikshitha P
Enter USN: 1BM23CS118
Enter marks for Subject 1: 99
Enter credits for Subject 1: 4
Enter marks for Subject 2: 98
Enter credits for Subject 2: 4
Enter marks for Subject 3: 94
Enter credits for Subject 3: 3
Enter marks for Subject 4: 87
Enter credits for Subject 4: 3
Enter marks for Subject 5: 89
Enter credits for Subject 5: 3
Enter marks for Subject 6: 97
Enter credits for Subject 6: 1
Enter marks for Subject 7: 95
Enter credits for Subject 7: 1
Enter marks for Subject 8: 95
Enter credits for Subject 8: 1
Name: Ikshitha P
USN: 1BM23CS118
SGPA: 9.70
```

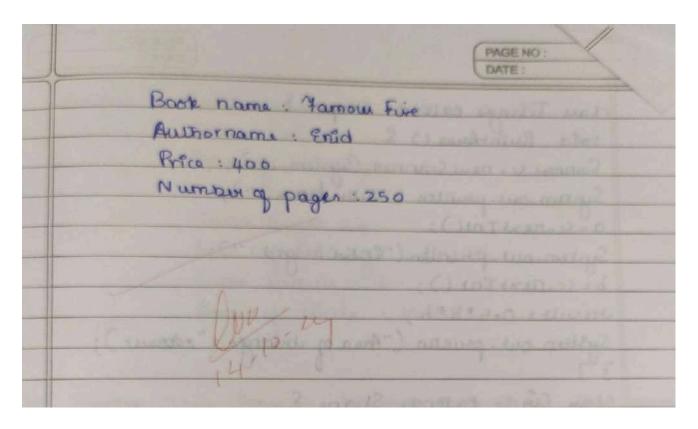
Enter name: ABC Enter USN: 1BM23CS888 Enter marks for Subject 1: 90 Enter credits for Subject 1: 4 Enter marks for Subject 2: 80 Enter credits for Subject 2: 2 Enter marks for Subject 3: 54 Enter credits for Subject 3: 5 Enter marks for Subject 4: 44 Enter credits for Subject 4: 2 Enter marks for Subject 5: 90 Enter credits for Subject 5: 1 Enter marks for Subject 6: 88 Enter credits for Subject 6: 3 Enter marks for Subject 7: 90 Enter credits for Subject 7: 6 Enter marks for Subject 8: 45 Enter credits for Subject 8: 2 Name: ABC JSN: 1BM23CS888

SGPA: 8.20

Create a class Book which contains four members: name,author, price, num\_pages. Include a constructor to set the values for the members. Include methods to set and get the details of the objects. Include a toString() method that could display the complete details of the book. Develop a Java program to create n book objects.

```
PAGE NO:
 umport gava util. Scanner :
 class Bootes 5
 String name;
 String author;
 un puice;
 und num Pages ;
Boots (String name, String author, in price, in numbager)
 Utili . name = name;
  Utin - author - author;
  utris . price = price ;
 this · num Pages : numPages ;
public String to String ()
 String name, author, purce, numPages;
 name = Book name : + this name + '\n';
 author = 'Author name: '+ this author + 'la';
 pouce = 'Price = '+ ithis . puice + 'In';
 numpager = 'Number of pager : ' +
 return name + author + price + numpages
3
Clau Main &
 Public static void main ( String august) ?
Scanner Sc= new Scanner (System is
System. out. priville ('Enter number of books: ');
in a = Sc. next Int ():
BOOK bil = new Books [n];
for ( un [=0; [ < n; [++)
 System our privilta ( Enter name: );
 Strong name = Sc-next();
```

```
DATE:
  System out printer ("Enter author:");
Siring author = Sc-next();
  System out printer ( 'Enter price : ');
  un pute = sc. next Int();
  System our privater ( Enter number of pager: );
  in num Pages = SC- Next IN ()
 b[i] = new Books (name, author, puice, numlages);
 System ow. printer ('Book details:');
 for Cun t=0; [cn; (++)
 System ow puinten (b[i]);
Output: Enter number of books: 2
        Enter name: Verity
        Enter author: (Allean
        Enter price: 300
        Enter number of pages: 250
        Enter name: Famous Fire
        Enter author: Collean
        enter price: 400
        Enter number of pages: 250
        Book details:
        Book name: Verily
        Autror name: College
        Price: 300
       Number of page: 250
```



#### 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()
String name, author, price, numPages;
name = "Book name: " + this.name + "\n";
author = "Author name: " + this.author + "\n";
price = "Price: " + this.price + "\n";
numPages = "Number of pages: " + this.numPages + "\n";
return name + author + price + numPages;
}
```

```
class Main
public static void main(String[] args)
Scanner sc = new Scanner(System.in);
String name;
String author;
int price;
int numPages;
System.out.println("Enter the number of books:");
n=sc.nextInt();
Books b[]=new Books[n];
for(int i=0;i< n;i++)
System.out.println("Enter the name of book:");
name=sc.next();
System.out.println("Enter the author of book:");
author=sc.next();
System.out.println("Enter the price of book:");
price=sc.nextInt();
System.out.println("Enter the number of page in book:");
numPages=sc.nextInt();
b[i] = new Books(name,author,price,numPages);
System.out.println("\nBook Details:");
for (int i = 0; i < n; i++)
System.out.println(b[i]);
```

Enter the number of books: 2 Enter the name of book: Verity
Enter the author of book: Collean Enter the price of book: 300 Enter the number of page in book: 250 Enter the name of book: Famousfive Enter the author of book: EnidBlyton Enter the price of book: 400 Enter the number of page in book: 250 Book Details: Book name: Verity Author name: Collean Price: 300 Number of pages: 250 Book name: Famousfive Author name: EnidBlyton Price: 400 Number of pages: 250 Name:Ikshitha P USN 1BM23CS118

Develop a Java program to create an abstract class named Shape that contains two integers and an empty method named printArea(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contain only the method printArea() that prints the area of the given shape.

Algorithm	Algorithm:				
9)	Auvelop a Java peroguam to create abuteace class called Shape that contains 2 unleques and an empty method name print Area (). Provide 3 classes recrange, itisangle, cui de such that each extends Shape. Each contain printered				
	that print area of shape.				
	umport jann. util. Scenner;				
	obstract clan Shape &				
	unt a, b; (2) and May Sittle Sittle				
	double result;				
	abstract void PountArea();				
	5 Shape & Clause Manual Harris				
	clan Rectangle extends Shape &				
	Scanner Sc= new Scanner (System. un);				
	Scanner SC= New Scarring ("Cotty Jenath:");				
ENLINE	System : Out . printer ("Enter dength:");				
	System.ow.printin ("Enter breadth: ");				
	System.ow.partition				
	b=scenextInt();				
	Septem ou printer ("Aread", + arton);				
	System ou printer ( Artisty Justille				
	3 3				

PAGE NO: class Triangle extends Shape & void Resint Assa D & Scanner St = new Scanner (System in); System our printer ("Enter bore :"); assenew Inil): System out printer ("Enter height:"); b=sc-resulter (); Hesult = 0.5+6+h; System ow printer ("Area of driangle: "+ stewn); Clan Circle Extends Shape & void Purishara () & Scanner sc = new Scanner (System in); System out printer ("Enter rodie : "); a=sc-new Inil); result = 3-14 \* a \* a ; System our printels ("Area of wide: dan Main & public storie void Main (String aug []) ? Rectange Us= new Rectangle (); H. Printaua (); Trangle d = new Trange (); ande c= new aside (); c. Pours Area ();

```
Ausa of the sample: 12.0

Enter haight: 4

Ausa of the angle: 12.0

Enter radiu: 7

Ausa of circle: 153.86
```

#### Code:

```
import java.util.Scanner;
abstract class Shape {
int a,b;
double result;
abstract void PrintArea();
class Rectangle extends Shape
void PrintArea()
Scanner sc=new Scanner(System.in);
System.out.println("Enter length of rectangle:");
a=sc.nextInt();
System.out.println("Enter breadth of rectangle:");
b=sc.nextInt();
result=a*b;
System.out.println("Area of rectangle:"+result);
class Triangle extends Shape
void PrintArea()
Scanner sc=new Scanner(System.in);
System.out.println("Enter base of triangle:");
```

```
a=sc.nextInt();
System.out.println("Enter height of triangle:");
b=sc.nextInt();
result=0.5*a*b;
System.out.println("Area of triangle:"+result);
class Circle extends Shape
void PrintArea()
Scanner sc=new Scanner(System.in);
System.out.println("Enter radius of circle:");
a=sc.nextInt();
result=3.14*a*a;
System.out.println("Area of circle:"+result);
class Main
public static void main(String args[])
Rectangle r=new Rectangle();
r.PrintArea();
Triangle t=new Triangle();
t.PrintArea();
Circle c=new Circle();
c.PrintArea();
System.out.println("Name:Ikshitha USN:118");
 D:\1BM23CS118>javac Main.java
 D:\1BM23CS118>java Main
 Enter length of rectangle:
 Enter breadth of rectangle:
 Area of rectangle:6.0
 Enter base of triangle:
 Enter height of triangle:
 Area of triangle:12.0
 Enter radius of circle:
 Area of circle:153.86
 Name:Ikshitha USN:118
```

Develop a Java program to create a class Bank that maintains two kinds of account for its customers, one called savings account and the other current account. The savings account provides compound interest and withdrawal facilities but no cheque book facility. The current account provides cheque book facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below this level, a service charge is imposed. Create a class Account that stores customer name, account number and type of account. From this derive the classes Cur-acct and Sav-acct to make them more specific to their requirements. Include the necessary methods in order to achieve the following tasks:

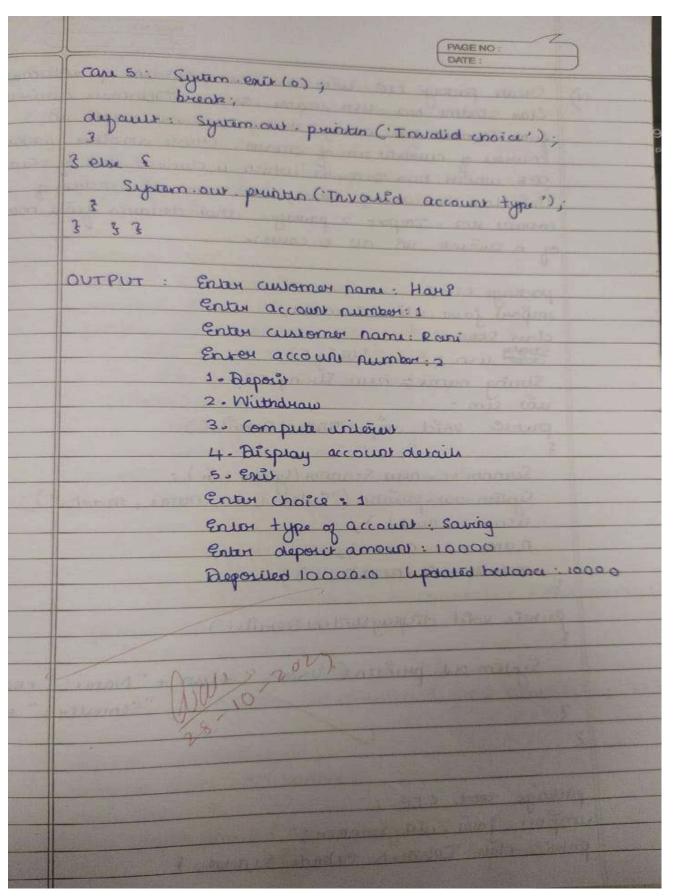
- a)Accept deposit from customer and update the balance.
- b)Display the balance.
- c)Compute and deposit interest
- d)Permit withdrawal and update the balance
- e) Check for the minimum balance, impose penalty if necessary and update the balance.

Aigorium.	the state of the s
10)	Develop Java Program to West Bank dan that maintains
3.60	two kinds of account for customers, one souring and
Honnie	other current account write a program with never any
	fundions.
	? (saveman settent) to send the siev orang
	umport java util Scanner;
	clan Account S
5.34	Sharing and Sharing ;
	un account Number;
	String account type;
	double balance;
	Account (String name, and accomment, String accitype) }
	Customer Name = name;
	account Number = accNumber;
	асстуре = асстурь;
	balance = 0; 3
10.4	public Vold deposit (double amount) {
	halance + - amount ;
	Sylem.ow. perinten ( 'Tepocited: '+ amount + Balance: +
	bollance
	11 -18 -1 P-10 - () \$
	public void displayBalance () {
50	System our printer ('Account Balance: ', balance);
	15 3 money's sunded bloods

```
public void withdraw (double amount) }
        System. ou - pountin ( This operation is specific to
   account types ); 33
  class SavAccaus extends Account 5
         double unterest Rate = 0.011;
       SavAccount (String name, un acc Number) f
          Super (name, Accordington, 'Saving '); }
    public void compute Interest () }
         double balance = balance * unionericate;
         balance + = unlikeli
          System out printer ('Interest added: '+unlivient +
                           'updated balance: + balance);
   public void withdraw (double amount) {
         if (balana = amouni) {
              belance -= amount;
         System-out-pritter ('Withdraum: +amoure); }
       System.ou. printer ('Insufficient balance');
clan Curacioun entends Account &
     double morbalance = 500.0;
     double surve Charge = 50.0;
     aux Account ( String name, une Acc Number) &
              Super (name, accNumber, 'aurus'); }
 public void check Min Balance () {
          if (balance & min Balance) &
                 bolance - = Service Change;
     System ow printer ( Balance des thou minimum
          Updated balance: ' + balance); 33
```

PAGE NO: 3 Chinows advice of mount of mount & if (balance > = amount) { balance - = amount ; System out-pounts ( Balance + balance); check Min Balance (); } else & System ou pountin ( Tosufficient Balance ); 333 public dan Bake 9 public static void mate (String augus) } Scanner sc = new Scanner (System-up) System out printer ("Entor name and account number") String name = Sc. next(); who account number = sc. next top (); SanAccount Sourcing Account = new San Account hame, Occours Cur Account current Account = new (we Account (names, account where (True) { System. Out. pruntan( 1. Deposit 2. Withdraw 3. Compute Interes 4. Bisplay Account Berich 5. Enil); System our printer ( enter choice ); who choice = Sc-next In(); System out - purito ( " Ente type of account "); String accompr= sconext); if (ace Type equals ('Saming')) & Switch (chaice) { Care 1: System. out printer ("Enter deposit amount" double deposit Amount = sc-next Double (); Saving Account , deposit (deposit Amount); bueak;

```
DATE
      case 2: System ou printin ( enter withdrawal amount
        double withdrawa Arnour = sc - next Double ();
         Sawings Account. withdraw (withdrawal Amount).
care 3: Saving Account compute Interest ();
case 4 = Cytern out painten ('automer name: + Saving Acous automu Nave)
           System out pounts ('Account number: '+
                                    saving Account account
                                                      Number)
          System out - printer ( Type of Account: '+ samination account Type)
            Savings Account a display Balance ();
care 5 : System enil (0);
 default: System out printin ('Invalid choice');
erre if (acc Type, equals ('auxon')) &
   Swith (choice) &
     care 1 . Syriam our print ( 'Entre amounts: ");
                double amount = Sc. new Double 1);
                current Account. deposit (amount);
                 break;
              System ow print ( Enter amount : 1);
               double amount = sconext Double ();
               Current Account. Wilhdraw (amount);
    care 3: System. out. prunter ('No unterest').
               break;
              Sylom. out. printer ('Name: + turrent Account
                                                  customer Name)
                break;
```



```
Code:
import java.util.Scanner;
class Account {
  String customerName;
  int accountNumber;
  String accountType;
  double balance;
  Account(String name, int accNumber, String accType) {
     customerName = name;
    accountNumber = accNumber;
    accountType = accType;
    balance = 0;
  public void deposit(double amount) {
    balance += amount;
    System.out.println("Deposited: " + amount + ". Updated balance: " + balance);
  public void displayBalance() {
    System.out.println("Account Balance: " + balance);
  public void withdraw(double amount) {
    System.out.println("This operation is specific to account type.");
class SavAccount extends Account {
  double interestRate = 0.04; // 4\% annual interest rate
  SavAccount(String name, int accNumber) {
    super(name, accNumber, "Savings");
  }
  public void computeInterest() {
     double interest = balance * interestRate;
    balance += interest:
```

System.out.println("Interest added: " + interest + ". Updated balance: " + balance);

```
}
  @Override
  public void withdraw(double amount) {
    if (balance >= amount) {
       balance -= amount;
       System.out.println("Withdrawn: " + amount + ". Updated balance: " + balance);
       System.out.println("Insufficient balance.");
  }
class CurAccount extends Account {
  double minBalance = 500.0;
  double serviceCharge = 50.0;
  CurAccount(String name, int accNumber) {
    super(name, accNumber, "Current");
  }
  public void checkMinBalance() {
    if (balance < minBalance) {
       balance -= serviceCharge;
       System.out.println("Balance below minimum. Service charge imposed: " + serviceCharge + ".
Updated balance: " + balance);
  }
  @Override
  public void withdraw(double amount) {
    if (balance >= amount) {
       balance -= amount;
       System.out.println("Withdrawn: " + amount + ". Updated balance: " + balance);
       checkMinBalance();
     } else {
       System.out.println("Insufficient balance.");
public class Bank {
  public static void main(String[] args) {
    Scanner sc = new Scanner(System.in);
    System.out.println("Enter customer name:");
    String name=sc.next();
```

```
System.out.println("Enter account number:"):
    int accountnumber=sc.nextInt();
    SavAccount savingsAccount = new SavAccount(name, accountnumber);
System.out.println("Enter customer name:");
    String name1=sc.next();
    System.out.println("Enter account number:");
    int accountnumber1=sc.nextInt();
    CurAccount currentAccount = new CurAccount(name1, accountnumber1);
    while (true) {
       System.out.println("\n----MENU-----");
       System.out.println("1. Deposit\n2. Withdraw\n3. Compute Interest for Savings Account\n4.
Display Account Details\n5. Exit");
       System.out.print("Enter your choice: ");
       int choice = sc.nextInt();
       System.out.print("Enter the type of account (saving/current): ");
       String accType = sc.next();
       if (accType.equals("saving")) {
         switch (choice) {
           case 1:
              System.out.print("Enter the deposit amount: ");
              double depositAmount = sc.nextDouble();
              savingsAccount.deposit(depositAmount);
              break;
           case 2:
              System.out.print("Enter the withdrawal amount: ");
              double withdrawalAmount = sc.nextDouble();
              savingsAccount.withdraw(withdrawalAmount);
              break;
           case 3:
              savingsAccount.computeInterest();
              break;
           case 4.
              System.out.println("Customer name: " + savingsAccount.customerName);
              System.out.println("Account number: " + savingsAccount.accountNumber);
              System.out.println("Type of Account: " + savingsAccount.accountType);
              savingsAccount.displayBalance();
              break;
           case 5:
              System.exit(0);
              break:
           default:
              System.out.println("Invalid choice.");
       } else if (accType.equals("current")) {
```

```
switch (choice) {
          case 1:
            System.out.print("Enter the deposit amount: ");
            double depositAmount = sc.nextDouble();
            currentAccount.deposit(depositAmount);
            break;
          case 2:
            System.out.print("Enter the withdrawal amount: ");
            double withdrawalAmount = sc.nextDouble();
            currentAccount.withdraw(withdrawalAmount);
            break;
          case 3:
            System.out.println("Current accounts do not earn interest.");
            break;
          case 4:
            System.out.println ("Customer name: "+currentAccount.customerName);\\
            System.out.println("Account number: " + currentAccount.accountNumber);
            System.out.println("Type of Account: " + currentAccount.accountType);
            currentAccount.displayBalance();
            break;
          case 5:
            System.exit(0);
            break;
          default:
            System.out.println("Invalid choice.");
     } else {
        System.out.println("Invalid account type.");
  }
}
```

```
C:\Users\Natar\Downloads>java Bank
Enter customer name:
Hari
Enter account number:
Enter customer name:
Rani
Enter account number:
 ----MENU---
1. Deposit
2. Withdraw
3. Compute Interest for Savings Account
4. Display Account Details
5. Exit
Enter your choice: 1
Enter the type of account (saving/current): saving
Enter the deposit amount: 10000
Deposited: 10000.0. Updated balance: 10000.0
Name: Ikshitha USN:118
    --MENU--
1. Deposit
2. Withdraw
3. Compute Interest for Savings Account
4. Display Account Details
5. Exit
Enter your choice: 4
Enter the type of account (saving/current): current
Customer name: Rani
Account number: 2
Type of Account: Current
Account Balance: 0.0
Name: Ikshitha USN:118
     -MENU-
1. Deposit
2. Withdraw
3. Compute Interest for Savings Account
4. Display Account Details
5. Exit
Enter your choice: 2
Enter the type of account (saving/current): saving
Enter the withdrawal amount: 3000
Withdrawn: 3000.0. Updated balance: 7000.0
Name:Ikshitha USN:118
     --MENU--
1. Deposit
2. Withdraw
3. Compute Interest for Savings Account
4. Display Account Details
5. Exit
Enter your choice: 3
Enter the type of account (saving/current): saving
Interest added: 280.0. Updated balance: 7280.0
Name:Ikshitha USN:118
     --MENU-----
```

Create a package CIE which has two classes- Student and Internals. The class Student has members like usn, name, sem. The class Internals derived from Student has an array that stores the internal marks scored in five courses of the current semester of the student. Create another package SEE which has the class External which is a derived class of Student. This class has an array that stores the SEE marks scored in five courses of the current semester of the student. Import the two packages in a file that declares the final marks of n students in all five courses.

rigorium	DATE:
11)	Quate package (15 with a classer, stituent & unternal.
	Class student has usn, name, sem. Internals derived from Student has array storing unternal marks us 5
	SEE which has surroad which is derived dan of studen.
	This class has away storing SEE mason in 5 courses of covern sem. Import 2 pairages it has declared final marks
	of a smaint up an e come.
	package CIE;
	clan Studen &
	Straing usn = new String ();
	String name = new String ();
	public void umpul Student Details()
	Scanner sc = new Scanner (System . dn); System ow printer ('Enter USN, name, marks');
	name = sc. nent();
	manter = Sc. next In ();
	public void display student Details ()
	System-out. privitin ("USN:" + usn + "Name: "+ name+ "Semester:" + sem);
- 11	3
3	
Po	chage set CIE;
ur	iport java. uld. Scanner;
	blic clair Inlaman enlands Switchen &

```
PAGE NO:
       in marine I = new une (5)
        Vold unput unput () &
        Scanner Scanner (System in);
         for (un =0; ec5; i++) {
               System out printer ('Marin : ');
              marker[i] = sc-newIn(); 3
        3 3 1
   package SEE;
   umport CTE mouta Internal :
   umport java-util Scanner;
   public clan External Extends Internal &
      ( Les vie men = [ Herom low
      ( [2] true war = [] loant (ru
      External () 9
        marks - new int [5];
         final - new in 157; 3
  public void unpulseEmouler () &
        Scanner Sc= new Scanner (System in );
       for ( uni i = 0; ics; i++) &
           Sopio ('Marin: ')
            markeli] = Sc. new Dry ;
            final.markeli] == markeli] + this markeli]
  public void displayFinal () 5
        display student ();
        for win i=0; i+5; i++ ) {
            System out puinten (final markelil); 333
umport SEE. Enluinals;
umport gava . util Sannu;
Class Main 9
    Void mais (String origil) ?
     Scanner sc= new scanner (System in);
```

```
PAGE NO
                              DATE :
      un n=sc. num [all);
    Enternal SIJ: new Enternals [n]
   for lund i=0; (4); (++) {
       Students slid= new Enternals (1);
        S[i]. unpir Studen ();
       5 CT . unput (15 marks ();
        S[i) wipu SEE marks ();
        S[i] . Oble Final marks ():
  Sopin ('Funa');
   for (un 2=0; l'an; itr)
     s (i) display Firal Marks ();
Entry number of students: 1
 USN = 1BH23CS118
 Name: Skehitha. P
 Semester : 3
 CIE mayer:
 Subject 1:48
SEE marks:
 Subject 2: 50
 Subject 3: 49
 Subject 4: 49
```

```
FAGE NO:
DATE:

Jaya (Folder)

Subject 1: 100

CIE (Package)

Subject 3: 98

Theorem Lan

Subject 4: 98

Subject 4: 98

Subject 5: 96

Main java
```

```
Code:
```

```
package CIE;
import java.util.Scanner;
public class Student {
  protected String usn;
  protected String name;
  protected int sem;
  public void inputStudentDetails() {
     Scanner s = new Scanner(System.in);
    System.out.print("Enter USN: ");
    usn = s.nextLine();
    System.out.print("Enter Name: ");
    name = s.nextLine();
    System.out.print("Enter Semester: ");
     sem = s.nextInt();
  public void displayStudentDetails() {
    System.out.println("USN: " + usn);
    System.out.println("Name: " + name);
    System.out.println("Semester: " + sem);
package CIE;
```

```
import java.util.Scanner;
public class Internals extends Student {
  protected int[] marks = new int[5];
  // Method to input internal marks
  public void inputCIEmarks() {
     Scanner s = new Scanner(System.in);
     System.out.println("Enter internal marks for 5 subjects:");
     for (int i = 0; i < 5; i++) {
       System.out.print("Enter marks for subject " + (i + 1) + ": ");
       marks[i] = s.nextInt();
package SEE;
import CIE.Internals;
import java.util.Scanner;
public class Externals extends Internals {
  protected int[] marks = new int[5];
  protected int[] finalMarks = new int[5];
  public Externals() {
     marks = new int[5];
     finalMarks = new int[5];
  public void inputSEEmarks() {
     Scanner s = new Scanner(System.in);
     System.out.println("Enter SEE marks for 5 subjects:");
     for (int i = 0; i < 5; i++) {
       System.out.print("Enter SEE marks for subject " + (i + 1) + ": ");
       marks[i] = s.nextInt();
  public void calculateFinalMarks() {
     for (int i = 0; i < 5; i++) {
       finalMarks[i] = marks[i] + this.marks[i]; // Final marks = internal + external
  }
```

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

```
C:\Users\Natar\Downloads\Java>javac -d C:\Users\Natar\Downloads\Java CIE\Student.java
C:\Users\Natar\Downloads\Java>javac -d C:\Users\Natar\Downloads\Java CIE\Internals.java
C:\Users\Natar\Downloads\Java>javac -d C:\Users\Natar\Downloads\Java SEE\Externals.java
C:\Users\Natar\Downloads\Java>javac -d C:\Users\Natar\Downloads\Java Main.java
error: file not found: Main.java
Usage: javac <options> <source files>
use --help for a list of possible options
C:\Users\Natar\Downloads\Java>javac -d C:\Users\Natar\Downloads\Java Main.java
C:\Users\Natar\Downloads\Java>java Main.java
Enter number of students: 2
Enter details for student 1:
Enter USN: 1BM23CS118
Enter Name: Ikshitha P
Enter Semester: 3
Enter internal marks for 5 subjects:
Enter marks for subject 1: 48
Enter marks for subject 2: 48
Enter marks for subject 3: 50
Enter marks for subject 4: 47
Enter marks for subject 5: 48
Enter SEE marks for 5 subjects:
Enter SEE marks for subject 1: 50
Enter SEE marks for subject 2: 50
Enter SEE marks for subject 3: 49
Enter SEE marks for subject 4: 49
Enter SEE marks for subject 5: 48
Enter details for student 2:
Enter USN: 1BM23CS100
Enter Name: ABC
Enter Semester: 3
Enter internal marks for 5 subjects:
Enter marks for subject 1: 44
Enter marks for subject 2: 45
Enter marks for subject 3: 46
Enter marks for subject 4: 47
Enter marks for subject 5: 48
Enter SEE marks for 5 subjects:
Enter SEE marks for subject 1: 49
Enter SEE marks for subject 2: 48
Enter SEE marks for subject 3: 47
Enter SEE marks for subject 4: 46
Enter SEE marks for subject 5: 45
```

```
Displaying final marks for all students:
USN: 1BM23CS118
Name: Ikshitha P
Semester: 3
Final Marks:
Subject 1: 100
Subject 2: 100
Subject 3: 98
Subject 4: 98
Subject 5: 96
USN: 1BM23CS100
Name: ABC
Semester: 3
Final Marks:
Subject 1: 98
Subject 2: 96
Subject 3: 94
Subject 4: 92
Subject 5: 90
```

Write a program that demonstrates handling of exceptions in inheritance tree. Create a base class called "Father" and derived class called "Son" which extends the base class. In Father class, implement a constructor which takes the age and throws the exception WrongAge() when the input age<0. In Son class, implement a constructor that cases both father and son's age and throws an exception if son's age is >=father's age.

Algorithm	
(9)	Write a java program with father and son classer that demonstrate handling exceptions un unheritance these.
V	umport java . util . scanner;
	Claim Woring Age contends Exception 5
3.0	Super ("Age Ever"); }
	Public Wrong Age (String menage) &  Super (menage); } }
	clan Fatner &
attug.	protected un father Age;  public Father () Unrown Warong Age &
	System ou printer ('Enter faither's age:');
	fallow Age = S. new Int ();
2017	therow new Wrong Age ("Age can't be negative");  3 3 7
	clan son entende Father &
	private une son Age;
	public son () thrown Wrong &
	Supley();
	Scanner S = new Scanner (System-in);

PAGE NO: System out , printen ( 'Enter son's age : '); son Age = s - new In(); ily son Age < 0 > therose new WrongAge ('Age cannot be negative'); ? of (son Age > = father Age) & throw new WrongAge ('Son's age age 1); 33 public void display () & Sydom our printer l'Son's age: '+ sonAg); public class Age Validation & public static void main (String augn (1) { itry & Son son = new son (); Son display (); 3 Carch (Wrong Age e) & Sylam.ow. punten ('Exception: + e.get Henry) Output: Enter Father's age: 51 Son's age cannot be queaten than father's age

```
import java.util.Scanner;
class WrongAge extends Exception {
public WrongAge() {
    super("Age Error");
public WrongAge(String message) {
   super(message);
class Father {
  protected int fatherAge;
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");
class Son extends Father {
  private int sonAge;
public Son() throws WrongAge {
    super();
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");
  }
  public void display() {
    System.out.println("Son's Age: " + sonAge);
public class AgeValidation {
```

```
public static void main(String[] args) {
System.out.println("Ikshitha P");
    try {
        Son son = new Son();
        son.display();
    } catch (WrongAge e) {
        System.out.println("Exception: " + e.getMessage());
    }
}
C:\Users\Natar\Downloads>javac AgeValidation.java
C:\Users\Natar\Downloads>javac AgeValidation
Ikshitha P
Enter Father's Age: 54
Enter Son's Age: 59
Exception: Son's age cannot be greater than or equal to Father's age
```

Write a program which creates two threads, one thread displaying "BMS College of Engineering" once every ten seconds and another displaying "CSE" once every two seconds.

Algorithm:	
	PAGE NO:
13)	Would Dyonia
	BHSCE' Once every the threads one thousand displaying
	'BHSCE' Once every iten seconds and another displaying "CSE' once every 2 seconds.
	The state of the s
	Clare College Thread extends Thread &
	Tunc) 3
	try \$
	while (true) 5
	Thread sleep (1999 0) : 33
	cater (Intoumpted Enception e) 5
	3 System ow prints ( course thread untirrupted);
an circle	3
	3
	Class CSE Thread extends Thread S
	The state of the s
	public void run() { try f
B TO LONG	Lithile (True) ?
	System-ow. pruritin ('CSE');
	Thread sleep (2000);
	3
	catch (Interrupted Enception e) f
	System out prints ('CSE throad uniterorupted):
	777
	A CONTRACT OF THE PROPERTY OF
	public dan Display Henage 5
	public static vois Main (Suring augs (7)
	public static void ruin c straig and
	College Thread college Threads = new
	(ollegeThread ();
	(SE Thread (seThreads = new (SEThread ();
	(Ollege Thread - Slaw ();
	3 3 cse Thouad . Start ();

```
class CollegeThread extends Thread {
    public void run() {
        try {
            for(int i=1;i<=10;i++){
                 System.out.println("BMS College of Engineering");
                Thread.sleep(10000);
            }
        } catch (InterruptedException e) {
            System.out.println("CollegeThread interrupted: " + e.getMessage());
        }
    }
}
class CSEThread extends Thread {
    public void run() {
        try {
            for(int i=1;i<=10;i++){
            }
        }
        }
}</pre>
```

```
System.out.println("CSE");
        Thread.sleep(2000);
    } catch (InterruptedException e) {
      System.out.println("CSEThread interrupted: " + e.getMessage());
  }
// Main class to run the threads
public class DisplayMessages {
 public static void main(String[] args) {
    CollegeThread collegeThread = new CollegeThread();
    CSEThread cseThread = new CSEThread();
    collegeThread.start();
    cseThread.start();
System.out.println("Ikshitha P");
  }
C:\Users\Natar\Downloads>javac DisplayMessages.java
C:\Users\Natar\Downloads>java DisplayMessages
Ikshitha P
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
```

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

Busine	the same of the sa
14)	Program that creater a user unlingace to perform
	urlèger dévision. Usen entens 2 numbers, division of
	both number us displayed in vasell. Throw appropriate
	ennors consissed required.
	The period of State of
	umport javax. swing. *;
	umport java aut * ",
	umport java . aust . event . * .
	(and ) gode hand
	clan Swing Bomo &
	Suring Bern O () {
many	I frame jfrm = new Iframe ('Divider app');
	ifrm. cot cyge (275,150);
	ffrm. Set Layow (new How Layow);
	JErm. Ser Default Close operation (J fram. EXIT-ON-CLOSE)
	Jeans glas = new Teaser ("Enter divisor & dividend");
	J Tenu Freid aff t = now J Tenu Field (8):
	I tem Field bit = new I Tem Field (8);
	JButton bullion = new Jewton ('(alculate');
	Jlabol ever = new Trakel ();
	J Later alab = new J Laber ();
	CONDIZE DE REPORTE DE LA CONTRACTION DEL CONTRACTION DE LA CONTRACTION DEL CONTRACTION DE LA CONTRACTI

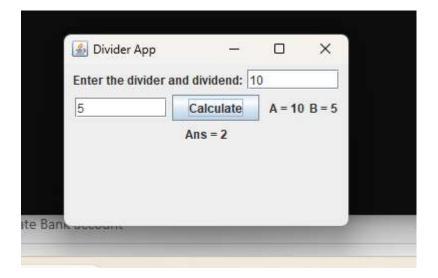
	PAGE NO:				
- 30	I Label blab = Down Tu				
	TO TO THE TOTAL OF				
	jfrm. add (plas).				
	+modd (aitt)				
	ymm.ada (bit):				
	15m · add (button):				
	1frm add (alab);				
	jfrm. add (blab);				
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	Action Listoner L = new Action Listoner (1)				
	Condition Performed (Action Event out ) E				
	Deviller ( Action excellence a soul coult a				
	Jan Calling (d);				
	bjet odd Action Liderth (u)				
	carch ( Acultimetic Enception e) {				
	alab - sal Text ('');				
	blob o set Tem ( ' ');				
	aniab witent ( 1 );				
15.07	eru · sel Tent ('B can't be zeno'); 33);				
	Public static void main (Strang augn(J) ?				
	frame on even Swing Utilities. invoke Latin (new Runnable)				
	public void run() S				
	new Swing Demo(); }}).37.				
	sunt sular autor.				
	Columniand named to allower was many				
	Dividen App				
	3 stellance annique service of sold				
	Enley divisor: [5]				
M.	Enter dévidend: [10] (calculate)				
9/11/	107 Resuv: 2				
19/1/2	( ) treate - Capacital Carl ) has not store				
3 O Guy tour 318 up					

```
import javax.swing.*;
import java.awt.*;
import java.awt.event.*;
class SwingDemo {
  SwingDemo() {
    JFrame ifrm = new JFrame("Divider App");
    ifrm.setSize(300, 200);
    ifrm.setLayout(new FlowLayout());
ifrm.setDefaultCloseOperation(JFrame.EXIT ON CLOSE);
     JLabel jlab = new JLabel("Enter the divider and dividend:");
    JTextField aitf = new JTextField(8);
    JTextField bitf = new JTextField(8);
     ajtf.setToolTipText("Enter an integer as the dividend");
    bitf.setToolTipText("Enter an integer as the divider");
    JButton button = new JButton("Calculate");
    JLabel err = new JLabel();
    JLabel alab = new JLabel();
    JLabel blab = new JLabel():
    JLabel anslab = new JLabel();
    ifrm.add(ilab);
    ifrm.add(ajtf);
    jfrm.add(bjtf);
    ifrm.add(button);
    ifrm.add(err); // Error label
    ifrm.add(alab); // Label for dividend
    jfrm.add(blab); // Label for divider
    jfrm.add(anslab); // Label for result
    button.addActionListener(new ActionListener() {
       public void actionPerformed(ActionEvent evt) {
            int a = Integer.parseInt(ajtf.getText());
            int b = Integer.parseInt(bjtf.getText());
            int ans = a / b;
            alab.setText("A = " + a);
            blab.setText("B = " + b);
            anslab.setText("Ans = " + ans);
            err.setText("");
          } catch (NumberFormatException e) {
            // Handle invalid number format
            alab.setText("");
            blab.setText("");
            anslab.setText("");
            err.setText("Error: Please enter valid integers!");
          } catch (ArithmeticException e) {
```

```
// Handle division by zero
alab.setText("");
blab.setText("");
anslab.setText("");
err.setText("Error: Divider (B) cannot be zero!");
}

// Display the frame
jfrm.setVisible(true);
}

public static void main(String args[]) {
    // Create the frame on the Event Dispatch Thread
    SwingUtilities.invokeLater(new Runnable() {
        public void run() {
            new SwingDemo();
        }
     });
}
```



Demonstrate Inter process Communication and deadlock

IPC:

```
PAGE NO DATE :
15) Demonstrate Inter Procent Communication & Deadlock.
    clan @ {
     un n:
    boolean Valuesas - false:
    synchronized with ger () &
    white ( ! value ser)
       System ow prusher ('In consumer Walling \n');
    carch (Interrupted Encoprison e) &
       Sentem on brough ( Eucobron condy, );
    System our printer ("got", +n);
     value set = falle;
     System.ow. printer ('In Talmate Producer In');
     Synchronized void pur (uni n) {
         ustite (valueset)
      try & System out pounds ('In Producer Warling In');
       courch (Interrupted Exception e) {
             System ou privilta ( '(augn '); 3; 3
      Value (a) - true;
     System out priviles ( In Intimate Consumer In );
  class Producer Implements Runnable &
    Producer (Qq) ?
        this . q = q ;
       new Thread (+his, 'Produces') . Stans (); 2
  public void run () 5
```

```
PAGE NO:
un (=0;
clan Consumer umpliment Runnabie ?
@q, >
Consumer (Qq) &
 thing = q;
new Thousand (this, "consumer") start (); 3
public void run () $
   น้ำ เ=0;
   2 (2123) s Winder
 un r=q.gu ();
irt; $23
class PCF: xed &
public static void main (String angres)
 Qq=newQ();
  new Producer (9);
  new Consum (q):
         Put:1
          Clet: I
           ejot : 3
           PW:4
          PW:5
           got: 5
```

```
class Q {
  int n;
  boolean valueSet = false;
  synchronized int get() {
    while (!valueSet) { // Wait if no value is available
         System.out.println("\nConsumer waiting\n");
         wait();
       } catch (InterruptedException e) {
         System.out.println("InterruptedException caught");
    System.out.println("Got: " + n);
    valueSet = false; // Value has been consumed
    System.out.println("\nIntimate Producer\n");
    notify(); // Notify producer to produce the next value
    return n;
  synchronized void put(int n) {
    while (valueSet) { // Wait if the previous value hasn't been consumed
       try {
         System.out.println("\nProducer waiting\n");
         wait();
       } catch (InterruptedException e) {
         System.out.println("InterruptedException caught");
     }
    this.n = n; // Store the produced value
    valueSet = true; // Mark the value as produced
    System.out.println("Put: " + n);
    System.out.println("\nIntimate Consumer\n");
    notify(); // Notify consumer to consume the value
  }
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++); // Produce values from 0 to 14
class Consumer implements Runnable {
Consumer(Q q) {
    this.q = q;
    new Thread(this, "Consumer").start();
public void run() {
    int i = 0;
    while (i < 15) {
       int r = q.get(); // Consume values
       System.out.println("Consumed: " + r);
       i++;
public class PCFixed {
  public static void main(String args[]) {
System.out.println("Ikshitha P");
    Q q = new Q(); // Shared resource
    new Producer(q); // Create producer
    new Consumer(q); // Create consumer
    System.out.println("Press Control-C to stop.");
  }
```

C:\Users\Natar\Downloads>javac PCFixed.java C:\Users\Natar\Downloads>java PCFixed Ikshitha P 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

Deadlock:

```
PAGE NO:
  dan A &
     Syntheorized void too (BD) &
        String name = Thread . (wown Thread () . get Name ();
        System ow pruntes (name + 'entired A. 100').
        they &
          Thread - sleep (1000) , 3
        couch (enception e) &
           Sylom ow printin ('A interrupted');
     System. ow. prints (name + 'trying to call B. Jan ()");
     bolow (); 3
     Void laut () &
        System-ow printto ( Truids A-last 1); 73
 clam B &
    Synchronized void ban (Aa) &
     ( ) : ( ); ( ) Ching name = Thread . ( ) - gern ane ( );
     System out private (name + "Entered Boban");
    USELY S
      Thread. Sleep (1000); 3
     carch (Enceptrón e) {
        System ow pounter ( B untervupted ), 3
     System ow printer (name + trying to call A. (av () );
      a olaw (); 3
 void law() 5
    System ow . printer (' Inside A last ') , 3 }
class Beadlock umplements Runnable &
      A a = new A ();
      B b = new B();
      Deadlock () &
```

	PAGE NO:
Thread · current Thread ().  Thread t=new Thread (th  t-slave();  a · foo(b);  System · o w · prints ('Bo	SU Name ('Noun Thread');
Public Void run () {  b.ban (a);  System ow prunter ('Back  public static void main (  new Beadlove (); 33.	in other thread 1); 5
Output: MainThread entered RacingThread entered MainThread druging Thride A. Ian Back in main I RacingThread druging Thread druging Thread A. Ian Back in other +	thuead  g to cau A-lan()
Die 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();
  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 B.last");
class Deadlock implements Runnable {
  A = new A();
  B b = new B();
  Deadlock() {
```

```
Thread.currentThread().setName("MainThread");
   // Create a new thread to simulate deadlock
   Thread t = new Thread(this, "RacingThread");
   t.start();
   // Main thread acquires lock on A and tries to call B.last()
   a.foo(b);
   System.out.println("Back in main thread");
 public void run() {
   // This thread acquires lock on B and tries to call A.last()
   b.bar(a);
   System.out.println("Back in other thread");
 public static void main(String args[]) {
    System.out.println("Ikshitha P");
   new Deadlock():
C:\Users\Natar\Downloads>javac Deadlock.java
C:\Users\Natar\Downloads>java Deadlock
Ikshitha P
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 B.last
Back in main thread
```