CS8383- Object Oriented Programming Lab Manual

B.E. - CSE - III Semester
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SRM VALLIAMMAI ENGINEERING COLLEGE

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CS8383-OBJECT ORIENTED PROGRAMMING LABORATORY

OBJECTIVES:

- To build software development skills using java programming for real-world applications.
- To understand and apply the concepts of classes, packages, interfaces, arraylist, exception handling and file processing.
- To develop applications using generic programming and event handling.

LIST OF EXPERIMENTS:

1. Develop a Java application to generate Electricity bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection (i.e domestic or commercial). Compute the bill amount using the following tariff.

   If the type of the EB connection is domestic, calculate the amount to be paid as follows:

   - ✓ First 100 units - Rs. 1 per unit
   - ✓ 101-200 units - Rs. 2.50 per unit
   - ✓ 201 -500 units - Rs. 4 per unit
   - ✓ > 501 units - Rs. 6 per unit

   If the type of the EB connection is commercial, calculate the amount to be paid as follows:

   - ✓ First 100 units - Rs. 2 per unit
   - ✓ 101-200 units - Rs. 4.50 per unit
   - ✓ 201 -500 units - Rs. 6 per unit
   - ✓ > 501 units - Rs. 7 per unit

2. Develop a java application to implement currency converter (Dollar to INR, EURO to INR, Yen to INR and vice versa), distance converter (meter to KM, miles to KM and vice versa), time converter (hours to minutes, seconds and vice versa) using packages.

3. Develop a java application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.

4. Design a Java interface for ADT Stack. Implement this interface using array. Provide necessary exception handling in both the implementations.

5. Write a program to perform string operations using ArrayList. Write functions for the following
    a. Append - add at end
    b. Insert – add at particular index
    c. Search
    d. List all string starts with given letter

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

7. Write a Java program to implement user defined exception handling.

8. Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes.

9. Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.

10. Write a java program to find the maximum value from the given type of elements using a generic function.

11. Design a calculator using event-driven programming paradigm of Java with the following options.
    a) Decimal manipulations
    b) Scientific manipulations

12. Develop a mini project for any application using Java concepts.

TOTAL: 60 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to

- Develop and implement Java programs for simple applications that make use of classes, packages and interfaces.
- Develop and implement Java programs with arraylist, exception handling and multithreading .
- Design applications using file processing, generic programming and event handling.

CS8383-OBJECT ORIENTED PROGRAMMING LABORATORY

CONTENTS

EX. NO : 1 **ELECTRICITY BILL GENERATION**
DATE:

AIM:

To develop a Java application to generate Electricity bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection (i.e domestic or commercial). Compute the bill amount using the following tariff.

If the type of the EB connection is domestic, calculate the amount to be paid as follows:

- First 100 units - Rs. 1 per unit
- 101-200 units - Rs. 2.50 per unit
- 201 -500 units - Rs. 4 per unit
- > 501 units - Rs. 6 per unit

If the type of the EB connection is commercial, calculate the amount to be paid as follows:

- First 100 units - Rs. 2 per unit
- 101-200 units - Rs. 4.50 per unit
- 201 -500 units - Rs. 6 per unit
- > 501 units - Rs. 7 per unit

ALGORITHM:

1. Start
2. Create a class **Ebill** with three member functions: **getdata(), calc(), display()** and object **ob** is created for another class **Customerdata**.
3. Create another class Customerdata which defines the above functions.
4. Using getdata() function get the consumed units for current and previous month .
5. Using calc()function calculate the amount depending on the type of EB connection and no. of units consumed.
6. Using display() function display the bill.
7. Stop.

PROGRAM:

```
import java.util.*;
class Ebill
{
        public static void main (String args[])
        {
        Customerdata ob = new Customerdata();
        ob.getdata();
        ob.calc();
        ob.display();
        }
}

class Customerdata
{
        Scanner in = new Scanner(System.in);
        Scanner ins = new Scanner(System.in);
        String cname,type;
        int bn;
        double current,previous,tbill,units;
        void getdata()
        {
                System.out.print ("\n\t Enter consumer number  ");
                bn = in.nextInt();
                System.out.print ("\n\t Enter Type of connection  (D for Domestic or C for Commercial) ");
                type = ins.nextLine();
                System.out.print ("\n\t Enter consumer name  ");
                cname = ins.nextLine();
                System.out.print ("\n\t Enter previous month reading  ");
                previous= in.nextDouble();
                System.out.print ("\n\t Enter current month reading  ");
                current= in.nextDouble();
        }
```

```
	void calc()
	{
		units=current-previous;
		if(type.equals("D"))
		{
			if (units<=100)
				tbill=1 * units;
			else if (units>100 && units<=200)
				tbill=2.50*units;
			else if(units>200 && units<=500)
				tbill= 4*units;
			else
				tbill= 6*units;
		}
		else
		{
			if (units<=100)
				tbill= 2 * units;
			else if(units>100 && units<=200)
				tbill=4.50*units;
			else if(units>200 && units<=500)
				tbill= 6*units;
			else
				tbill= 7*units;
		}
	}
	void display()
	{
		System.out.println("\n\t Consumer number = "+bn);
		System.out.println ("\n\t Consumer name = "+cname);
		if(type.equals("D"))
			System.out.println ("\n\t type of connection  = DOMESTIC ");
		else
			System.out.println ("\n\t type of connection  = COMMERCIAL ");
			System.out.println ("\n\t Current Month  Reading = "+current);
			System.out.println ("\n\t Previous Month  Reading = "+previous);
			System.out.println ("\n\t Total units = "+units);
			System.out.println ("\n\t Total bill = RS "+tbill);
	}
}
```

OUTPUT:

D:\ >javac Ebill.java
D:\ >java Ebill

```
Enter consumer number  1001
Enter Type of connection  (D for Domestic or C for Commercial) D
Enter consumer name  Sachin
Enter previous month reading  3000
Enter current month reading  4000
Consumer number = 1001
Consumer name = Sachin
type of connection  = DOMESTIC
Current Month  Reading = 4000.0
Previous Month  Reading = 3000.0
Total units = 1000.0
Total bill = RS 6000.0
```

RESULT:

Thus the java program to generate electricity bill was implemented, executed successfully and the output was verified.

EX NO : 2 **CURRENCY CONVERTER, DISTANCE CONVERTER AND TIME CONVERTER IMPLEMENTATION USING PACKAGES**

DATE:

AIM:

To develop a java application to implement currency converter (Dollar to INR, EURO to INR, Yen to INR and vice versa), distance converter (meter to KM, miles to KM and vice versa) , time converter (hours to minutes, seconds and vice versa) using packages.

ALGORITHM:

1. Start
2. Create a Package **currencyconversion** and place the class **currency** under the package
3. Create the methods to perform currency conversion from dollar to rupee, rupee to dollar, euro to rupee, rupee to euro, yen to rupee and rupee to yen.
4. Create the package **distanceconverion** and create the class **distance** within the package
5. Create the methods to convert from meter to km, km to meter, miles to km, km to miles
6. Create the package **timeconversion** and create the class **timer** .Create the methods to convert from hours to minutes ,hours to seconds , minutes to hours and seconds to hours
7. Create a class **converter** and import the packages currencyconversion, distanceconversion and time conversion. Create the objects for the class currency, distance and timer.
8. Get the choice from the user and invoke the methods to perform the corresponding conversion and display the value.
9. Stop

PROGRAM:

currency.java

```
package currencyconversion;
import java.util.*;
public class currency
{
        double inr,usd;
        double euro,yen;
        Scanner in=new Scanner(System.in);
        public void dollartorupee()
        {
                System.out.println("Enter dollars to convert into Rupees:");
                usd=in.nextInt();
                inr=usd*67;
                System.out.println("Dollar ="+usd+"equal to INR="+inr);
        }
        public void rupeetodollar()
        {
                System.out.println("Enter Rupee to convert into Dollars:");
                inr=in.nextInt();
                usd=inr/67;
                System.out.println("Rupee ="+inr+"equal to Dollars="+usd);
        }
        public void eurotorupee()
        {
                System.out.println("Enter euro to convert into Rupees:");
                euro=in.nextInt();
                inr=euro*79.50;
                System.out.println("Euro ="+euro +"equal to INR="+inr);
        }
        public void rupeetoeuro()
        {
                System.out.println("Enter Rupees to convert into Euro:");
                inr=in.nextInt();
                euro=(inr/79.50);
                System.out.println("Rupee ="+inr +"equal to Euro="+euro);
        }
```

```
	public void yentorupee()
	{
		System.out.println("Enter yen to convert into Rupees:");
		yen=in.nextInt();
		inr=yen*0.61;
		System.out.println("YEN="+yen +"equal to INR="+inr);
	}
	public void rupeetoyen()
	{
		System.out.println("Enter Rupees to convert into Yen:");
		inr=in.nextInt();
		yen=(inr/0.61);
		System.out.println("INR="+inr +"equal to YEN"+yen);
	}
}
```

distance.java

```
package distanceconversion;
import java.util.*;
public class distance
{
	double km,m,miles;
	Scanner sc = new Scanner(System.in);
	public void kmtom()
	{
		System.out.print("Enter in km ");
		km=sc.nextDouble();
		m=(km*1000);
		System.out.println(km+"km" +"equal to"+m+"metres");
	}
	public void mtokm()
	{
		System.out.print("Enter in meter ");
		m=sc.nextDouble();
		km=(m/1000);
		System.out.println(m+"m" +"equal to"+km+"kilometres");
	}
	public void milestokm()
	{
		System.out.print("Enter in miles");
		miles=sc.nextDouble();
		km=(miles*1.60934);
		System.out.println(miles+"miles" +"equal to"+km+"kilometres");
	}
	public void kmtomiles()
	{
		System.out.print("Enter in km");
		km=sc.nextDouble();
		miles=(km*0.621371);
		System.out.println(km+"km" +"equal to"+miles+"miles");
	}
}
```

timer.java

```
package timeconversion;
import java.util.*;
public class timer
{
	int hours,seconds,minutes;
	int input;
	Scanner sc = new Scanner(System.in);
	public void secondstohours()
	{
		System.out.print("Enter the number of seconds: ");
		input = sc.nextInt();
```

```
                hours = input / 3600;
                minutes = (input % 3600) / 60;
                seconds = (input % 3600) % 60;
                System.out.println("Hours: " + hours);
                System.out.println("Minutes: " + minutes);
                System.out.println("Seconds: " + seconds);
        }
        public void minutestohours()
        {
                System.out.print("Enter the number of minutes: ");
                minutes=sc.nextInt();
                hours=minutes/60;
                minutes=minutes%60;
                System.out.println("Hours: " + hours);
                System.out.println("Minutes: " + minutes);
        }
        public void hourstominutes()
        {
                System.out.println("enter the no of hours");
                hours=sc.nextInt();
                minutes=(hours*60);
                System.out.println("Minutes: " + minutes);
        }
        public void hourstoseconds()
        {
                System.out.println("enter the no of hours");
                hours=sc.nextInt();
                seconds=(hours*3600);
                System.out.println("Minutes: " + seconds);
        }
}
```

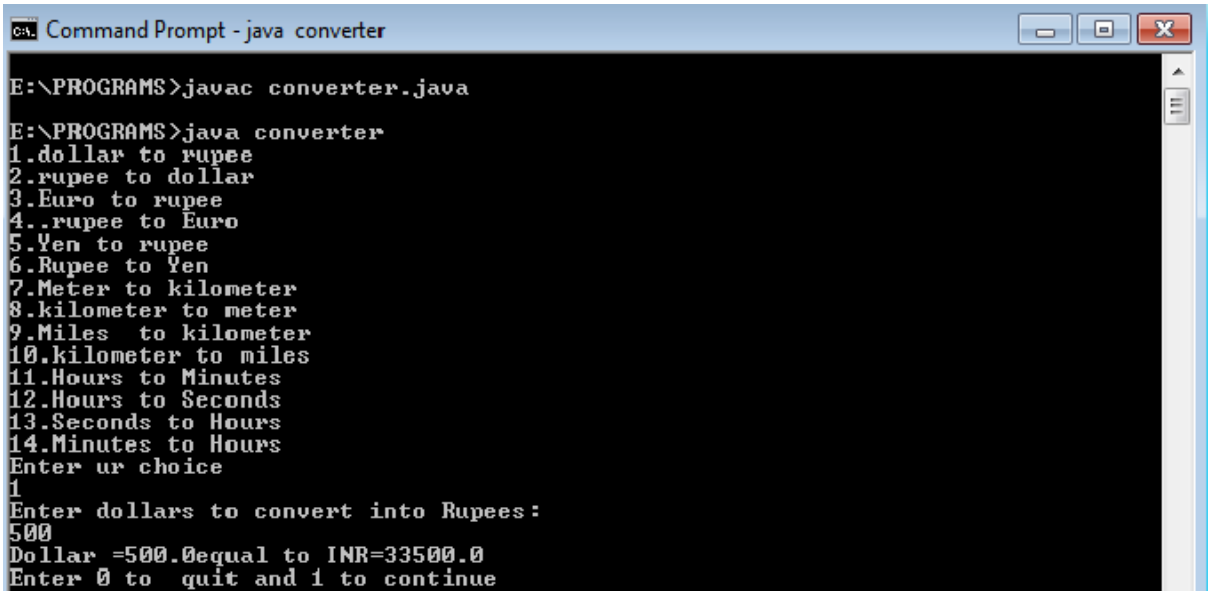
converter.java

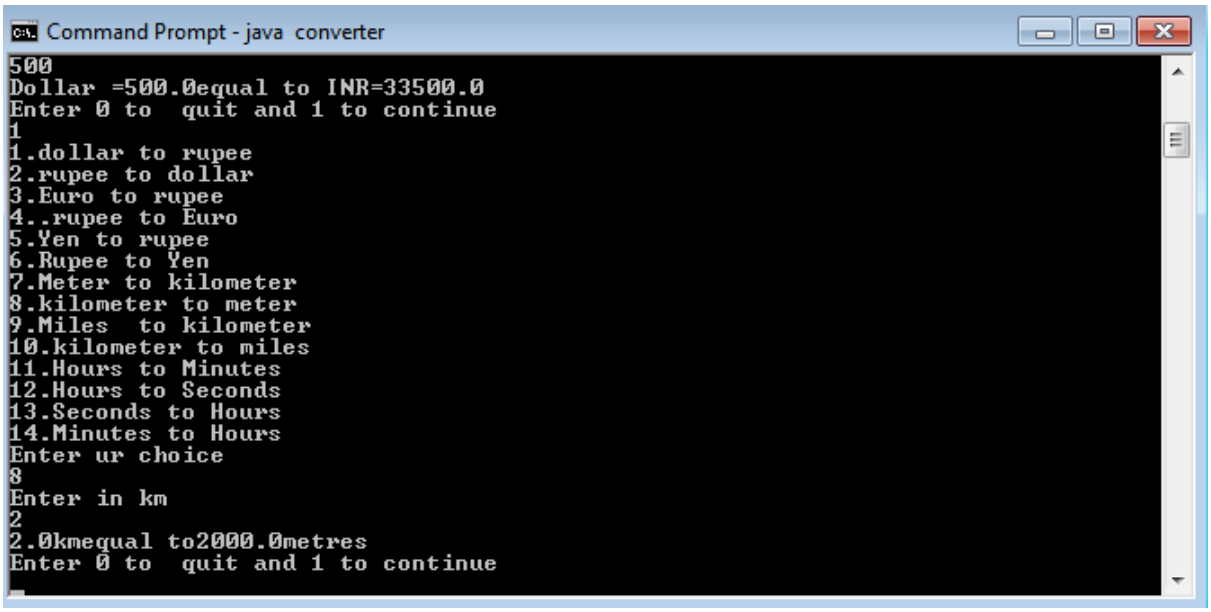
```
import java.util.*;
import java.io.*;
import currencyconversion.*;
import distanceconversion.*;
import timeconversion.*;
class converter
{
        public static void main(String args[])
        {
        Scanner s=new Scanner(System.in);
        int choice,ch;
        currency c=new currency();
        distance d=new distance();
        timer t=new timer();
        do
            {
                System.out.println("1.dollar to rupee ");
                System.out.println("2.rupee to dollar ");
                System.out.println("3.Euro to rupee ");
                System.out.println("4..rupee to Euro ");
                System.out.println("5.Yen to rupee ");
                System.out.println("6.Rupee to Yen ");
                System.out.println("7.Meter to kilometer ");
                System.out.println("8.kilometer to meter ");
                System.out.println("9.Miles  to kilometer ");
                System.out.println("10.kilometer to miles");
                System.out.println("11.Hours to Minutes");
                System.out.println("12.Hours to Seconds");
                System.out.println("13.Seconds to Hours");
                System.out.println("14.Minutes to Hours");
                System.out.println("Enter ur choice");
                choice=s.nextInt();
```

```
switch(choice)
{
        case 1:
        {
                c.dollartorupee();
                break;
        }
        case 2:
        {
                c.rupeetodollar();
                break;
        }
        case 3:
        {
                c.eurotorupee();
                break;
        }
        case 4:
        {
                c.rupeetoeuro();
                break;
        }
        case 5:
        {
                c.yentorupee();
                break;
        }
        case 6:
        {
                c.rupeetoyen();
                break;
        }
        case 7:
        {
                d.mtokm();
                break;
        }
        case 8:
        {
                d.kmtom();
                break;
        }
        case 9:
        {
                d.milestokm();
                break;
        }
        case 10  :
        {
                d.kmtomiles();
                break;
        }
        case 11:
        {
                t.hourstominutes();
                break;
        }
        case 12:
        {
                t.hourstoseconds();
                break;
        }
```

```
                        case 13:
                        {
                                t.secondstohours();
                                break;
                        }
                        case 14:
                        {
                                t.minutestohours();
                                break;
                        }
                    }
                    System.out.println("Enter 0 to  quit and 1 to continue ");
                    ch=s.nextInt();
                }
                while(ch==1);
            }
}
```

OUTPUT:





RESULT

Thus the Java application to implement currency converter, distance converter and time converter was implemented, executed successfully and the output was verified.

EX NO: 3 **PAYSLIP GENERATION USING INHERITANCE**
DATE:

AIM:

To develop a java application to generate pay slip for different category of employees using the concept of **inheritance**.

ALGORITHM:

1. Start
2. Create the class **Employee** with name, Empid, address, mailid, mobileno as data members.
3. Inherit the classes **Programmer**, **Asstprofessor**, **Associateprofessor** and **Professor** from employee class.
4. Add Basic Pay (BP) as the member of all the inherited classes.
5. Calculate DA as 97% of BP, HRA as 10% of BP, PF as 12% of BP, Staff club fund as 0.1% of BP.
6. Calculate gross salary and net salary.
7. Generate payslip for all categories of employees.
8. Create the objects for the inherited classes and invoke the necessary methods to display the Payslip
9. Stop

PROGRAM:

Salary.java

```
import java.util.*;
class Employee
{
        int empid;
        long mobile;
        String name, address, mailid;
        Scanner get = new Scanner(System.in);
        void getdata()
        {
                System.out.println("Enter Name of the Employee");
                name = get.nextLine();
                System.out.println("Enter Mail id");
                mailid = get.nextLine();
                System.out.println("Enter Address of the Employee:");
                address = get.nextLine();
                System.out.println("Enter employee id ");
                empid = get.nextInt();
                System.out.println("Enter Mobile Number");
                mobile = get.nextLong();
        }
        void display()
        {
                System.out.println("Employee Name: "+name);
                System.out.println("Employee id : "+empid);
                System.out.println("Mail id : "+mailid);
                System.out.println("Address: "+address);
                System.out.println("Mobile Number: "+mobile);
        }
}

class Programmer extends Employee
{
        double salary,bp,da,hra,pf,club,net,gross;
        void getprogrammer()
        {
                System.out.println("Enter basic pay");
                bp = get.nextDouble();
        }
```

```
	void calculateprog()
	{
		da=(0.97*bp);
		hra=(0.10*bp);
		pf=(0.12*bp);
		club=(0.1*bp);
		gross=(bp+da+hra);
		net=(gross-pf-club);
		System.out.println("*********************************************");
		System.out.println("PAY SLIP FOR PROGRAMMER");
		System.out.println("*********************************************");
		System.out.println("Basic Pay: Rs. "+bp);
		System.out.println("DA: Rs. "+da);
		System.out.println("HRA: Rs. "+hra);
		System.out.println("PF: Rs. "+pf);
		System.out.println("CLUB: Rs. "+club);
		System.out.println("GROSS PAY: Rs. "+gross);
		System.out.println("NET PAY: Rs. "+net);
	}
}
class Asstprofessor extends Employee
{
	double salary,bp,da,hra,pf,club,net,gross;
	void getasst()
	{
		System.out.println("Enter basic pay");
		bp = get.nextDouble();
	}
	void calculateasst()
	{
		da=(0.97*bp);
		hra=(0.10*bp);
		pf=(0.12*bp);
		club=(0.1*bp);
		gross=(bp+da+hra);
		net=(gross-pf-club);
		System.out.println("************************************");
		System.out.println("PAY SLIP FOR ASSISTANT PROFESSOR");
		System.out.println("************************************");
		System.out.println("Basic Pay: Rs. "+bp);
		System.out.println("DA: Rs. "+da);
		System.out.println("HRA: Rs. "+hra);
		System.out.println("PF: Rs. "+pf);
		System.out.println("CLUB: Rs. "+club);
		System.out.println("GROSS PAY: Rs. "+gross);
		System.out.println("NET PAY: Rs. "+net);
	}
}
class Associateprofessor extends Employee
{
	double salary,bp,da,hra,pf,club,net,gross;
	void getassociate()
	{
		System.out.println("Enter basic pay");
		bp = get.nextDouble();
	}
	void calculateassociate()
	{
		da=(0.97*bp);
		hra=(0.10*bp);
		pf=(0.12*bp);
		club=(0.1*bp);
		gross=(bp+da+hra);
		net=(gross-pf-club);
```

```
                System.out.println("************************************");
                System.out.println("PAY SLIP FOR ASSOCIATE PROFESSOR");
                System.out.println("************************************");
                System.out.println("Basic Pay: Rs. "+bp);
                System.out.println("DA: Rs. "+da);
                System.out.println("HRA: Rs. "+hra);
                System.out.println("PF: Rs. "+pf);
                System.out.println("CLUB: Rs. "+club);
                System.out.println("GROSS PAY: Rs. "+gross);
                System.out.println("NET PAY: Rs. "+net);
        }
}
class Professor extends Employee
{
        double salary,bp,da,hra,pf,club,net,gross;
        void getprofessor()
        {
                System.out.println("Enter basic pay");
                bp = get.nextDouble();
        }
        void calculateprofessor()
        {
                da=(0.97*bp);
                hra=(0.10*bp);
                pf=(0.12*bp);
                club=(0.1*bp);
                gross=(bp+da+hra);
                net=(gross-pf-club);
                System.out.println("*************************");
                System.out.println("PAY SLIP FOR PROFESSOR");
                System.out.println("*************************");
                System.out.println("Basic Pay: Rs. "+bp);
                System.out.println("DA: Rs. "+da);
                System.out.println("HRA: Rs. "+hra);
                System.out.println("PF: Rs. "+pf);
                System.out.println("CLUB: Rs. "+club);
                System.out.println("GROSS PAY: Rs. "+gross);
                System.out.println("NET PAY: Rs. "+net);
        }
}
class Salary
{
        public static void main(String args[])
        {
                int choice,cont;
                do
                {
                System.out.println("PAYROLL");
                System.out.println(" 1.PROGRAMMER \t 2.ASSISTANT PROFESSOR \t 3.ASSOCIATE
                                        PROFESSOR \t 4.PROFESSOR ");
                Scanner c = new Scanner(System.in);
                System.out.print("Enter Your Choice:");
                choice=c.nextInt();
                switch(choice)
                {
                        case 1:
                        {
                                Programmer p=new Programmer();
                                p.getdata();
                                p.getprogrammer();
                                p.display();
                                p.calculateprog();
                                break;
                        }
```

```
                        case 2:
                        {
                                Asstprofessor asst=new Asstprofessor();
                                asst.getdata();
                                asst.getasst();
                                asst.display();
                                asst.calculateasst();
                                break;
                        }
                        case 3:
                        {
                                Associateprofessor asso=new Associateprofessor();
                                asso.getdata();
                                asso.getassociate();
                                asso.display();
                                asso.calculateassociate();
                                break;
                        }
                        case 4:
                        {
                                Professor prof=new Professor();
                                prof.getdata();
                                prof.getprofessor();
                                prof.display();
                                prof.calculateprofessor();
                                break;
                        }
                }
                        System.out.print("Please enter 0 to quit and 1 to continue: ");
                        cont=c.nextInt();
            }while(cont==1);
        }
}
```

OUTPUT

```
1.PROGRAMMER   2.ASSISTANT PROFESSOR   3.ASSOCIATE PROFESSOR   4.PROFESSOR
Enter Your Choice: 2
Enter Name of the Employee: Arun K
Enter Mail id: arun007@gmail.com
Enter Address of the Employee: 12, Anna Nagar, Chennai-65
Enter employee id: 5002
Enter Mobile Number: 9876543210
Enter basic pay : 20000
Employee Name: Arun K
Employee id : 5002
Mail id : arun007@gmail.com
Address: 12, Anna Nagar, Chennai-65
Mobile Number: 9876543210
**********************************
PAY SLIP FOR ASSISTANT PROFESSOR
**********************************
Basic Pay:Rs. 20000.0
DA:Rs. 19400.0
HRA:Rs. 2000.0
PF:Rs. 2400.0
CLUB:Rs. 2000.0
GROSS PAY:Rs. 41400.0
NET PAY:Rs. 37000.0
Please enter 0 to quit and 1 to continue: 0
```

RESULT

Thus the Java application to generate pay slip for different category of employees was implemented using inheritance and the program was executed successfully.

EX NO: 4 **STACK ADT IMPLEMENTATION USING INHERITANCE (INTERFACE)**
DATE:

AIM

To design a Java application to implement array implementation of stack using the concept of **Interface** and **Exception handling**.

ALGORITHM

1. Start
2. Create the interface **Stackoperation** with method declarations for push and pop.
3. Create the class **Astack** which implements the interface and provides implementation for the methods push and pop. Also define the method for displaying the values stored in the stack. Handle the stack overflow and stack underflow condition.
4. Create the class **teststack**. Get the choice from the user for the operation to be performed and also handle the exception that occur while performing the stack operation.
5. Create the object and invoke the method for push, pop, display based on the input from the user.
6. Stop.

PROGRAM

Teststack.java

```
import java.io.*;
interface Stackoperation
{
        public void push(int i);
        public void pop();
}

class Astack implements Stackoperation
{
        int stack[]=new int[5];
        int top=-1;
        int i;
        public void push(int item)
        {
                if(top>=4)
                {
                        System.out.println("Overflow");
                }
                else
                {
                        top=top+1;
                        stack[top]=item;
                        System.out.print("Element pushed: "+stack[top]);
                }
        }
        public void pop()
        {
                if(top<0)
                        System.out.println("Underflow");
                else
                {
                        System.out.print("Element popped: "+stack[top]);
                        top=top-1;
                }
        }
```

```
	public void display()
	{
		if(top<0)
			System.out.println("No Element in stack");
		else
		{
			for(i=0;i<=top;i++)
			System.out.println("Element:"+stack[i]);
		}
	}
}

class Teststack
{
	public static void main(String args[]) throws IOException
	{
		int ch,c;
		int i;
		Astack s=new Astack();
		DataInputStream in=new DataInputStream(System.in);
		do
		{
		  try
		  {
			System.out.println("ARRAY STACK");
			System.out.println("1.Push  2.Pop  3.Display  4.Exit");
			System.out.print("Enter your Choice:");
			ch=Integer.parseInt(in.readLine());
			switch(ch)
			{
			case 1:
				System.out.print("Enter the value to push:");
				i=Integer.parseInt(in.readLine());
				s.push(i);
				break;
			case 2:
				s.pop();
				break;
			case 3:
				System.out.println("The elements are: ");
				s.display();
				break;
			default:
				break;
			}
		  }
		  catch(IOException e)
		 {
			System.out.println("IO Error");
		  }
			System.out.println("Please enter 0 to quit and  1 to continue ");
			c=Integer.parseInt(in.readLine());
		}while(c==1);
	}
}
```

OUTPUT

```
D:\ >javac Teststack.java
D:\ >java Teststack
ARRAY STACK
1.Push  2.Pop  3.Display  4.Exit
Enter your Choice: 1
Enter the value to push: 10
Element pushed: 10
Please enter 0 to quit and  1 to continue
1
ARRAY STACK
1.Push  2.Pop  3.Display  4.Exit
Enter your Choice: 1
Enter the value to push: 20
Element pushed: 20
Please enter 0 to quit and  1 to continue
1
ARRAY STACK
1.Push  2.Pop  3.Display  4.Exit
Enter your Choice: 1
Enter the value to push: 30
Element pushed: 30
Please enter 0 to quit and  1 to continue
1
ARRAY STACK
1.Push  2.Pop  3.Display  4.Exit
Enter your Choice: 3
The elements are:
Element: 10
Element: 20
Element: 30
Please enter 0 to quit and  1 to continue
1
ARRAY STACK
1.Push  2.Pop  3.Display  4.Exit
Enter your Choice: 2
Element popped: 30
Please enter 0 to quit and  1 to continue
1
ARRAY STACK
1.Push  2.Pop  3.Display  4.Exit
Enter your Choice: 3
The elements are:
element:10
element:20
Please enter 0 to quit and  1 to continue
0
```

RESULT

Thus the Java application for ADT stack operations has been implemented and executed successfully.

EX NO: 5 **STRING OPERATIONS USING ARRAY LIST**
DATE:

AIM

To write a java program to perform string operations using ArrayList for the following functions:

a. Append - add at end
b. Insert – add at particular index
c. Search
d. List all string starts with given letter

ALGORITHM:

1. Start
2. Create the class **Arraylistexample**. Create the object for the **ArrayList** class.
3. Display the options to the user for performing string handling .
4. Use the function add() to append the string at the end and to insert the string at the particular index.
5. The function sort () is used to sort the elements in the array list.
6. The function indexof() is used to search whether the element is in the array list or not.
7. The function startsWith () is used to find whether the element starts with the specified character.
8. The function remove() is used to remove the element from the arraylist.
9. The function size() is used to determine the number of elements in the array list.
10. Stop.

PROGRAM:

Arraylistexample.java

```
import java.util.*;
import java.io.*;
public class Arraylistexample
{
        public static void main(String args[]) throws IOException
        {
        ArrayList<String> obj = new ArrayList<String>();
        DataInputStream in=new DataInputStream(System.in);
        int c,ch;
        int i,j;
        String str,str1;
        do
        {
                System.out.println("STRING MANIPULATION");
                System.out.println("************************");
                System.out.println("1. Append at end \t 2.Insert at particular index \t 3.Search \t");
                System.out.println("4. List string that starting with letter \t");
                System.out.println("5. Size   \t 6.Remove   \t 7.Sort   \t 8.Display\t" );
                System.out.println("Enter the choice ");
                c=Integer.parseInt(in.readLine());
                switch(c)
                 {
                 case 1:
                 {
                        System.out.println("Enter the string ");
                        str=in.readLine();
                        obj.add(str);
                        break;
                 }
```

```
case 2:
{
        System.out.println("Enter the string ");
        str=in.readLine();
        System.out.println("Specify the index/position to insert");
        i=Integer.parseInt(in.readLine());
        obj.add(i-1,str);
        System.out.println("The array list has following elements:"+obj);
        break;
}
case 3:
{
        System.out.println("Enter the string to search ");
        str=in.readLine();
        j=obj.indexOf(str);
        if(j==-1)
        System.out.println("Element not found");
        else
        System.out.println("Index of:"+str+"is"+j);
        break;
}
case 4:
{
        System.out.println("Enter the character to List string that starts with specified
        character");
        str=in.readLine();
        for(i=0;i<(obj.size()-1);i++)
        {
                str1=obj.get(i);
                if(str1.startsWith(str))
                {
                        System.out.println(str1);
                }
        }
        break;
}
case 5:
{
        System.out.println("Size of the list "+obj.size());
        break;
}
case 6:
{
        System.out.println("Enter the element to remove");
        str=in.readLine();
        if(obj.remove(str))
        {
                System.out.println("Element Removed"+str);
        }
        else
        {
                System.out.println("Element not present");
        }
         break;
}
```

```
                    case 7:
                    {
                            Collections.sort(obj);
                            System.out.println("The array list has following elements:"+obj);
                            break;
                    }
                    case 8:
                    {
                             System.out.println("The array list has following elements:"+obj);
                             break;
                    }
            }
             System.out.println("Please Enter 0 to break and 1 to continue");
             ch=Integer.parseInt(in.readLine());
            }while(ch==1);
    }
}
```

OUTPUT

```
D:\Java Programs>javac Arraylistexample.java
D:\Java Programs>java Arraylistexample

STRING MANIPULATION
************************
1. Append at end        2.Insert at particular index    3.Search
4. List string that starting with letter
5. Size         6.Remove        7.Sort          8.Display
Enter the choice: 1
Enter the string: FIRST
Enter 0 to break and 1 to continue : 1

STRING MANIPULATION
************************
1. Append at end        2.Insert at particular index    3.Search
4. List string that starting with letter
5. Size         6.Remove        7.Sort          8.Display
Enter the choice: 1
Enter the string : LAST
Enter 0 to break and 1 to continue : 1

STRING MANIPULATION
************************
1. Append at end        2.Insert at particular index    3.Search
4. List string that starting with letter
5. Size         6.Remove        7.Sort          8.Display
Enter the choice : 8
The array list has following elements:[FIRST, LAST]
Enter 0 to break and 1 to continue : 1

STRING MANIPULATION
************************
1. Append at end        2.Insert at particular index    3.Search
4. List string that starting with letter
5. Size         6.Remove        7.Sort          8.Display
Enter the choice : 2
Enter the string: SECOND
Specify the index/position to insert : 1
The array list has following elements:[SECOND, FIRST, LAST]
Enter 0 to break and 1 to continue: 1
```

```
STRING MANIPULATION
************************
1. Append at end        2.Insert at particular index    3.Search
4. List string that starting with letter
5. Size         6.Remove        7.Sort          8.Display
Enter the choice : 3
Enter the string to search: LAST
Index of: LAST is 2
Enter 0 to break and 1 to continue : 1

STRING MANIPULATION
************************
1. Append at end        2.Insert at particular index    3.Search
4. List string that starting with letter
5. Size         6.Remove        7.Sort          8.Display
Enter the choice : 5
Size of the list 3
Enter 0 to break and 1 to continue: 1

STRING MANIPULATION
************************
1. Append at end        2.Insert at particular index    3.Search
4. List string that starting with letter
5. Size         6.Remove        7.Sort          8.Display
Enter the choice : 7
The array list has following elements:[FIRST, LAST, SECOND]
Enter 0 to break and 1 to continue : 0
```

RESULT

Thus the java program to perform string operations using ArrayList has been implemented and executed successfully.

EX NO : 6 **ABSTRACT CLASS IMPLEMENTATION**
DATE :

AIM

To write a Java program to calculate the area of rectangle, circle and triangle using the concept of abstract class.

ALGORITHM:

1. Start
2. Create an abstract class named **shape** that contains two integers and an empty method named **printarea**().
3. Provide three classes named rectangle, triangle and circle such that each one of the classes extends the class Shape.
4. Each of the inherited class from shape class should provide the implementation for the method **printarea**().
5. Get the input and calculate the area of rectangle, circle and triangle.
6. In the **shapeclass**, create the objects for the three inherited classes and invoke the methods and display the area values of the different shapes.
7. Stop.

PROGRAM

Shapeclass.java

```
import java.util.*;
abstract class shape
{
        int a,b;
        abstract public void printarea();
}
class rectangle extends shape
{
        public int area_rect;
        public void printarea()
        {
                Scanner s=new Scanner(System.in);
                System.out.println("Enter the length and breadth of rectangle");
                a=s.nextInt();
                b=s.nextInt();
                area_rect=a*b;
                System.out.println("Length of rectangle: "+a +"breadth of rectangle: "+b);
                System.out.println("The area of rectangle is:"+area_rect);
        }
 }
class triangle extends shape
{
        double area_tri;
        public void printarea()
        {
                Scanner s=new Scanner(System.in);
                System.out.println("Enter the base and height of triangle:");
                a=s.nextInt();
                b=s.nextInt();
                System.out.println("Base of triangle: "+a +"height of triangle:  "+b);
                area_tri=(0.5*a*b);
                System.out.println("The area of triangle is:"+area_tri);
        }
}
```

```
class circle extends shape
{
	double area_circle;
	public void printarea()
	{
		Scanner s=new Scanner(System.in);
		System.out.println("Enter the radius of circle:");
		a=s.nextInt();
		area_circle=(3.14*a*a);
		System.out.println("Radius of circle:"+a);
		System.out.println("The area of circle is:"+area_circle);
	}
}

public class Shapeclass
{
	 public static void main(String[] args)
	{
		rectangle r=new rectangle();
		r.printarea();
		triangle t=new triangle();
		t.printarea();
		circle r1=new circle();
		r1.printarea();
	}
}
```

OUTPUT

```
D:\Java Programs>javac Shapeclass.java
D:\Java Programs>java Shapeclass
Enter the length and breadth of rectangle:
2
3
Length of rectangle: 2 breadth of rectangle: 3
The area of rectangle is:6

Enter the base and height of triangle:
5
6
Base of triangle: 5 height of triangle:  6
The area of triangle is: 15.0

Enter the radius of circle
4
Radius of circle: 4
The area of circle is:50.24
```

RESULT

Thus the Java program for calculate the area of rectangle, circle and triangle was implemented and executed successfully.

EX NO : 7 **USER DEFINED EXCEPTION HANDLING IMPLEMENTATION**
DATE :

AIM

To write a Java program to implement user defined exception handling.

ALGORITHM:

1. Start
2. Create a class **NegativeAmtException** which extends Exception class.
3. Create a constructor which receives the string as argument.
4. Get the Amount as input from the user.
5. If the amount is negative, the exception will be generated.
6. Using the exception handling mechanism , the thrown exception is handled by the catch construct.
7. After the exception is handled , the string “invalid amount “ will be displayed.
8. If the amount is greater than 0, the message “Amount Deposited “ will be displayed
9. Stop.

PROGRAM 1:

userdefined.java

```
import java.util.*;
class NegativeAmtException extends Exception
{
        String msg;
        NegativeAmtException(String msg)
        {
                this.msg=msg;
        }
        public String toString()
        {
                return msg;
        }
}
public class userdefined
{
        public static void main(String[] args)
        {
                Scanner s=new Scanner(System.in);
                System.out.print("Enter Amount:");
                int a=s.nextInt();
                try
                {
                if(a<0)
                        {
                        throw new NegativeAmtException("Invalid Amount");
                        }
                System.out.println("Amount Deposited");
                }
                catch(NegativeAmtException e)
                {
                System.out.println(e);
                }
        }
}
```

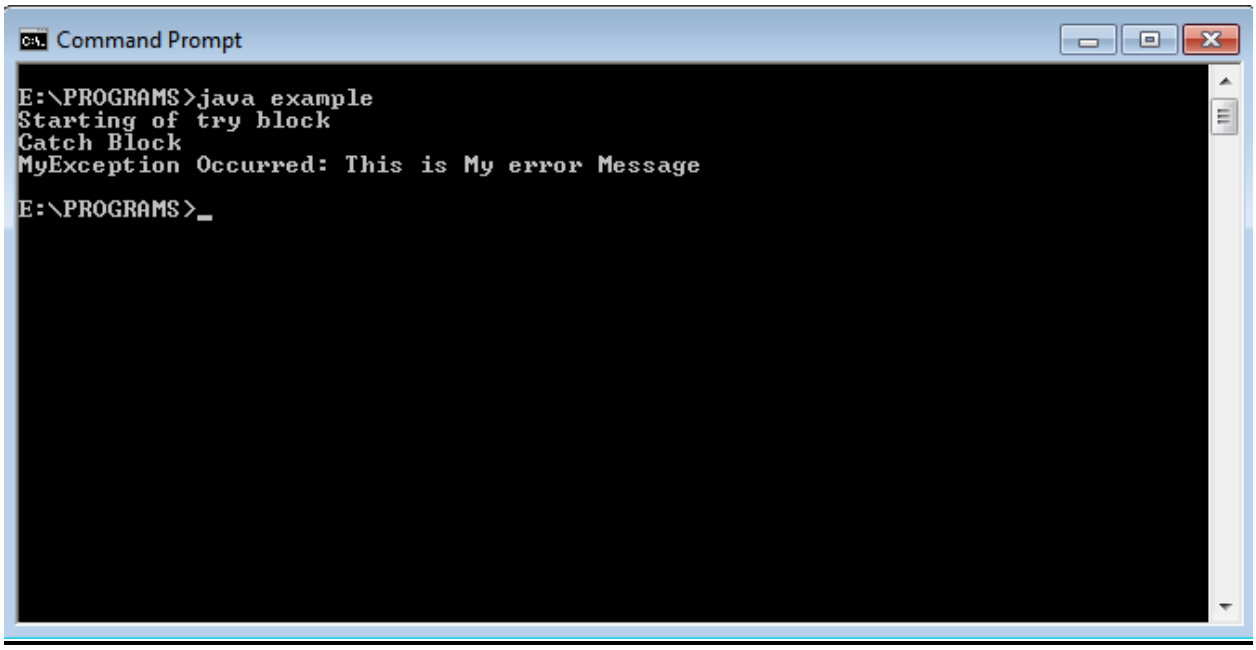
OUTPUT

PROGRAM 2:

example.java

```
class MyException extends Exception
{
        String str1;
        MyException(String str2)
         {
                str1=str2;
          }
         public String toString()
        {
                return ("MyException Occurred: "+str1) ;
         }
}
class example
{
         public static void main(String args[])
        {
                try
                {
                        System.out.println("Starting of try block");
                        throw new MyException("This is My error Message");
                }
                catch(MyException exp)
                {
                        System.out.println("Catch Block") ;
                        System.out.println(exp) ;
                }
        }
}
```

OUTPUT



RESULT

Thus the Java program to implement user defined exception handling has been implemented and executed successfully.

EX NO : 8 **FILE HANDLING**
DATE :

AIM

To write a java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes.

ALGORITHM:

1. Start
2. Create a class **filedemo**. Get the file name from the user.
3. Use the file functions and display the information about the file.
4. getName() displays the name of the file.
5. getPath() diplays the path name of the file.
6. getParent () -This method returns the pathname string of this abstract pathname's parent, or
7. null if this pathname does not name a parent directory.
8. exists() – Checks whether the file exists or not.
9. canRead()-This method is basically a check if the file can be read.
10. canWrite()-verifies whether the application can write to the file.
11. isDirectory() – displays whether it is a directory or not.
12. isFile() – displays whether it is a file or not.
13. lastmodified() – displays the last modified information.
14. length()- displays the size of the file.
15. delete() – deletes the file
16. Invoke the predefined functions to display the information about the file.
17. Stop.

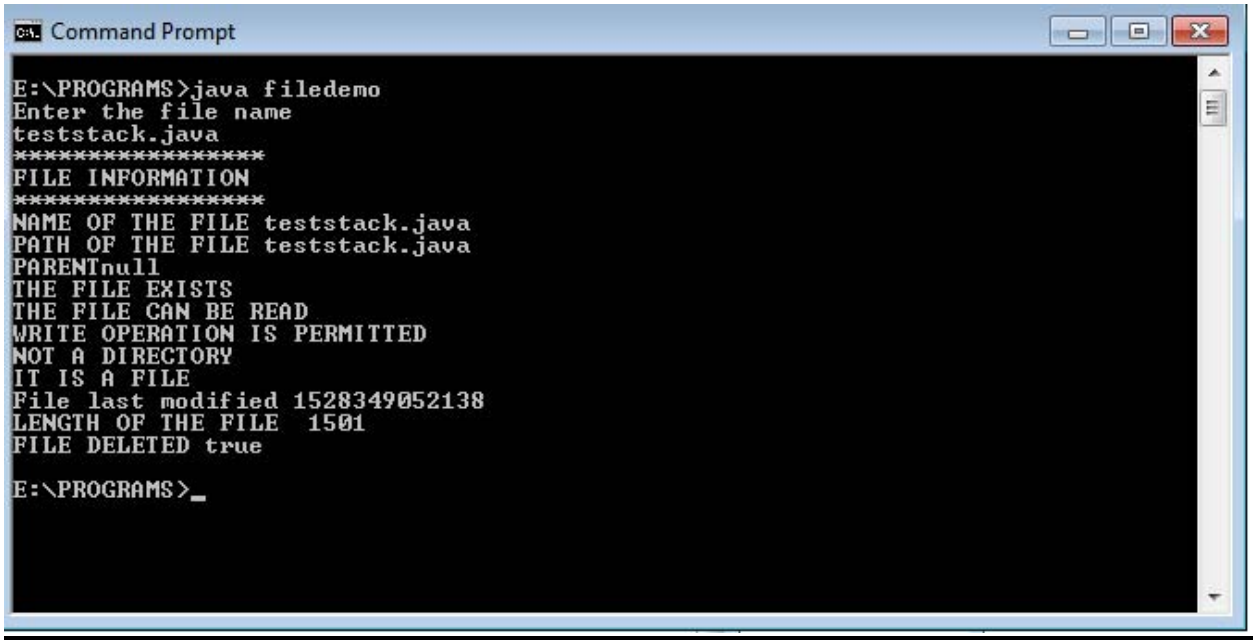
PROGRAM

filedemo.java

```
import java.io.*;
import java.util.*;
class filedemo
{
        public static void main(String args[])
        {
        String filename;
        Scanner s=new Scanner(System.in);
        System.out.println("Enter the file name ");
        filename=s.nextLine();
        File f1=new File(filename);
        System.out.println("******************");
        System.out.println("FILE INFORMATION");
        System.out.println("******************");
        System.out.println("NAME OF THE FILE "+f1.getName());
        System.out.println("PATH OF THE FILE "+f1.getPath());
        System.out.println("PARENT"+f1.getParent());
        if(f1.exists())
                System.out.println("THE FILE EXISTS ");
        else
                System.out.println("THE FILE DOES NOT ExISTS ");
        if(f1.canRead())
                System.out.println("THE FILE CAN BE READ ");
        else
                System.out.println("THE FILE CANNOT BE READ  ");
        if(f1.canWrite())
                System.out.println("WRITE OPERATION IS PERMITTED");
```

```
        else
                System.out.println("WRITE OPERATION IS NOT PERMITTED");
        if(f1.isDirectory())
                System.out.println("IT IS A DIRECTORY ");
        else
                System.out.println("NOT A DIRECTORY");
        if(f1.isFile())
                System.out.println("IT IS A FILE ");
        else
                System.out.println("NOT A FILE");
        System.out.println("File last modified "+ f1.lastModified());
        System.out.println("LENGTH OF THE FILE  "+f1.length());
        System.out.println("FILE DELETED "+f1.delete());
        }
}
```

OUTPUT



RESULT

Thus the java program to display file information has been implemented and executed successfully.

EX NO : 9 **MULTITHREADING IMPLEMENTATION**
DATE :

AIM

To write a java program that implements a multi-threaded application.

ALGORITHM:

1. Start
2. Create a class **even** which implements first thread that computes the square of the number .
3. run() method implements the code to be executed when thread gets executed.
4. Create a class **odd** which implements second thread that computes the cube of the number.
5. Create a third thread that generates random number. If the random number is even, it displays the square of the number. If the random number generated is odd, it displays the cube of the given number.
6. The Multithreading is performed and the task switched between multiple threads.
7. The sleep () method makes the thread to suspend for the specified time.
8. Stop.

PROGRAM

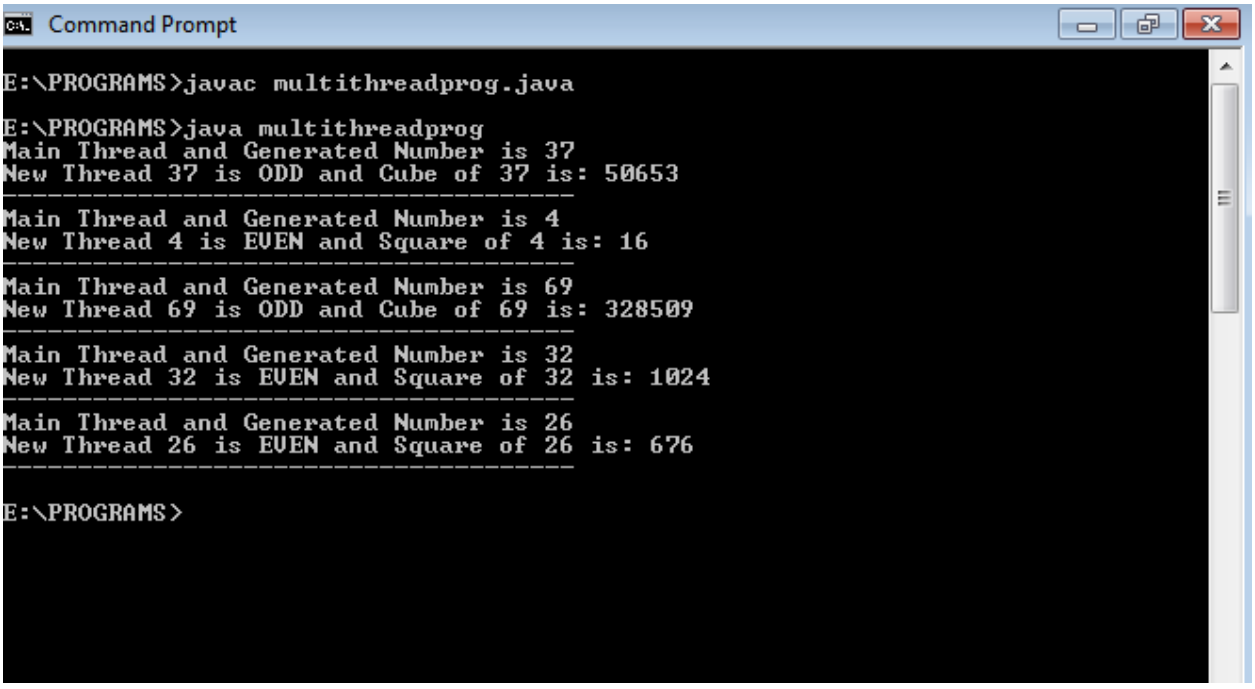
multithreadprog.java

```
import java.util.*;
class even implements Runnable
{
        public int x;
        public even(int x)
        {
                this.x = x;
        }
        public void run()
        {
              System.out.println("New Thread "+ x +" is EVEN and Square of " + x + " is: " + x * x);
        }
}
class odd implements Runnable
{
        public int x;
        public odd(int x)
        {
                this.x = x;
        }
        public void run()
        {
              System.out.println("New Thread "+ x +" is ODD and Cube of " + x + " is: " + x * x * x);
        }
}
class A extends Thread
{
        public void run()
        {
                int num = 0;
                Random r = new Random();
                try
                {
                        for (int i = 0; i < 5; i++)
                        {
                                num = r.nextInt(100);
```

```
                                System.out.println("Main Thread and Generated Number is " + num);
                                if (num % 2 == 0)
                                {
                                        Thread t1 = new Thread(new even(num));
                                        t1.start();
                                }
                                else
                                {
                                        Thread t2 = new Thread(new odd(num));
                                        t2.start();
                                }
                                Thread.sleep(1000);
                                System.out.println("--------------------------------------");
                        }
                }
                catch (Exception ex)
                {
                        System.out.println(ex.getMessage());
                }
        }
}

public class multithreadprog
{
        public static void main(String[] args)
        {
                A a = new A();
                a.start();
        }
}
```

OUTPUT



RESULT

Thus the Java program for multi-threaded application has been implemented and executed successfully.

EX NO : 10 **GENERIC FUNCTION IMPLEMENTATION**

DATE :

AIM

To write a java program to find the maximum value from the given type of elements using a generic function.

ALGORITHM:

1. Start
2. Create a class **Myclass** to implement generic class and generic methods.
3. Get the set of the values belonging to specific data type.
4. Create the objects of the class to hold integer, character and double values.
5. Create the method to compare the values and find the maximum value stored in the array.
6. Invoke the method with integer, character or double values. The output will be displayed based on the data type passed to the method.
7. Stop.

PROGRAM

genericdemo.java

```
class MyClass<T extends Comparable<T>>
{
	T[] vals;
	MyClass(T[] o)
	{
		vals = o;
	}
	public T min()
	{
		T v = vals[0];
		for(int i=1; i < vals.length; i++)
		if(vals[i].compareTo(v) < 0)
		v = vals[i];
		return v;
	}
	public T max()
	{
		T v = vals[0];
		for(int i=1; i < vals.length;i++)
		if(vals[i].compareTo(v) > 0)
		v = vals[i];
		return v;
	}
}
class genericdemo
{
	public static void main(String args[]) {
		int i;
		Integer inums[]={10,2,5,4,6,1};
		Character chs[]={'v','p','s','a','n','h'};
		Double d[]={20.2,45.4,71.6,88.3,54.6,10.4};
		MyClass<Integer> iob = new MyClass<Integer>(inums);
		MyClass<Character> cob = new MyClass<Character>(chs);
		MyClass<Double>dob = new MyClass<Double>(d);
		System.out.println("Max value in inums: " + iob.max());
		System.out.println("Min value in inums: " + iob.min());
		System.out.println("Max value in chs: " + cob.max());
		System.out.println("Min value in chs: " + cob.min());
		System.out.println("Max value in chs: " + dob.max());
		System.out.println("Min value in chs: " + dob.min());
	}
}
```

OUTPUT

```
D:\>Java Prgs>javac genericdemo.java
D:\>Java Prgs>java genericdemo
Max value in inums: 10
Max value in inums: 1
Max value in chs: v
Max value in chs: a
Max value in chs: 88.3
Max value in chs: 10.4
```

RESULT

Thus the Java program to find the maximum value from the given type of elements has been implemented using generics and executed successfully.

EX NO : 11 **CALCULATOR DESIGN USING EVENT DRIVEN PROGRAMMING**
DATE :

AIM

To design a calculator using event driven programming paradigm of Java with the following options

a) Decimal Manipulations
b) Scientific Manipulations

ALGORITHM:

1. Start
2. Import the swing packages and awt packages.
3. Create the class **scientificcalculator** that implements action listener.
4. Create the container and add controls for digits, scientific calculations and decimal Manipulations.
5. The different layouts can be used to lay the controls.
6. When the user presses the control, the event is generated and handled.
7. The corresponding decimal, numeric and scientific calculations are performed.
8. Stop

PROGRAM

```
import java.awt.*;
import javax.swing.*;
import java.awt.event.*;
import javax.swing.event.*;
public class ScientificCalculator extends JFrame implements ActionListener
{
        JTextField tfield;
        double temp, temp1, result, a;
        static double m1, m2;
        int k = 1, x = 0, y = 0, z = 0;
        char ch;
        JButton b1, b2, b3, b4, b5, b6, b7, b8, b9, zero, clr, pow2, pow3, exp,
        fac, plus, min, div, log, rec, mul, eq, addSub, dot, mr, mc, mp,
        mm, sqrt, sin, cos, tan;
        Container cont;
        JPanel textPanel, buttonpanel;
        ScientificCalculator()
        {
        cont = getContentPane();
        cont.setLayout(new BorderLayout());
        JPanel textpanel = new JPanel();
        tfield = new JTextField(25);
        tfield.setHorizontalAlignment(SwingConstants.RIGHT);
        tfield.addKeyListener(new KeyAdapter()
         {
                public void keyTyped(KeyEvent keyevent)
                 {
                        char c = keyevent.getKeyChar();
                        if (c >= '0' && c <= '9') { }
                        else
                        {
                                keyevent.consume();
                        }
                }
        });
        textpanel.add(tfield);
```

```
buttonpanel = new JPanel();
buttonpanel.setLayout(new GridLayout(8, 4, 2, 2));
boolean t = true;
mr = new JButton("MR");
buttonpanel.add(mr);
mr.addActionListener(this);
mc = new JButton("MC");
buttonpanel.add(mc);
mc.addActionListener(this);
mp = new JButton("M+");
buttonpanel.add(mp);
mp.addActionListener(this);
mm = new JButton("M-");
buttonpanel.add(mm);
mm.addActionListener(this);
b1 = new JButton("1");
buttonpanel.add(b1);
b1.addActionListener(this);
b2 = new JButton("2");
buttonpanel.add(b2);
b2.addActionListener(this);
b3 = new JButton("3");
buttonpanel.add(b3);
b3.addActionListener(this);
b4 = new JButton("4");
buttonpanel.add(b4);
b4.addActionListener(this);
b5 = new JButton("5");
buttonpanel.add(b5);
b5.addActionListener(this);
b6 = new JButton("6");
buttonpanel.add(b6);
b6.addActionListener(this);
b7 = new JButton("7");
buttonpanel.add(b7);
b7.addActionListener(this);
b8 = new JButton("8");
buttonpanel.add(b8);
b8.addActionListener(this);
b9 = new JButton("9");
buttonpanel.add(b9);
b9.addActionListener(this);
zero = new JButton("0");
buttonpanel.add(zero);
zero.addActionListener(this);
plus = new JButton("+");
buttonpanel.add(plus);
plus.addActionListener(this);
min = new JButton("-");
buttonpanel.add(min);
min.addActionListener(this);
mul = new JButton("*");
buttonpanel.add(mul);
mul.addActionListener(this);
div = new JButton("/");
div.addActionListener(this);
buttonpanel.add(div);
addSub = new JButton("+/-");
buttonpanel.add(addSub);
```

```
        addSub.addActionListener(this);
        dot = new JButton(".");
        buttonpanel.add(dot);
        dot.addActionListener(this);
        eq = new JButton("=");
        buttonpanel.add(eq);
        eq.addActionListener(this);
        rec = new JButton("1/x");
        buttonpanel.add(rec);
        rec.addActionListener(this);
        sqrt = new JButton("Sqrt");
        buttonpanel.add(sqrt);
        sqrt.addActionListener(this);
        log = new JButton("log");
        buttonpanel.add(log);
        log.addActionListener(this);
        sin = new JButton("SIN");
        buttonpanel.add(sin);
        sin.addActionListener(this);
        cos = new JButton("COS");
        buttonpanel.add(cos);
        cos.addActionListener(this);
        tan = new JButton("TAN");
        buttonpanel.add(tan);
        tan.addActionListener(this);
        pow2 = new JButton("x^2");
        buttonpanel.add(pow2);
        pow2.addActionListener(this);
        pow3 = new JButton("x^3");
        buttonpanel.add(pow3);
        pow3.addActionListener(this);
        exp = new JButton("Exp");
        exp.addActionListener(this);
        buttonpanel.add(exp);
        fac = new JButton("n!");
        fac.addActionListener(this);
        buttonpanel.add(fac);
        clr = new JButton("AC");
        buttonpanel.add(clr);
        clr.addActionListener(this);
        cont.add("Center", buttonpanel);
        cont.add("North", textpanel);
        setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
}
public void actionPerformed(ActionEvent e)
{
        String s = e.getActionCommand();
        if (s.equals("1"))
        {
                if (z == 0)
                {
                        tfield.setText(tfield.getText() + "1");
                }
                else {
                        tfield.setText("");
                        tfield.setText(tfield.getText() + "1");
                        z = 0;
                }
}
```

```
if (s.equals("2")) {
if (z == 0) {
tfield.setText(tfield.getText() + "2");
}
else
{
tfield.setText("");
tfield.setText(tfield.getText() + "2");
z = 0;
}
}
if (s.equals("3")) {
if (z == 0) {
tfield.setText(tfield.getText() + "3");
}
else
{
tfield.setText("");
tfield.setText(tfield.getText() + "3");
z = 0;
}
}
if (s.equals("4")) {
if (z == 0) {
tfield.setText(tfield.getText() + "4");
}
else
{
tfield.setText("");
tfield.setText(tfield.getText() + "4");
z = 0;
}
}
if (s.equals("5")) {
if (z == 0) {
tfield.setText(tfield.getText() + "5");
}
else
{
tfield.setText("");
tfield.setText(tfield.getText() + "5");
z = 0;
}
}
if (s.equals("6")) {
if (z == 0) {
tfield.setText(tfield.getText() + "6");
}
else
 {
tfield.setText("");
tfield.setText(tfield.getText() + "6");
z = 0;
}
}
if (s.equals("7")) {
if (z == 0) {
tfield.setText(tfield.getText() + "7");
}
```

```
else
{
tfield.setText("");
tfield.setText(tfield.getText() + "7");
z = 0;
}
}
if (s.equals("8")) {
if (z == 0) {
tfield.setText(tfield.getText() + "8");
}
else
{
tfield.setText("");
tfield.setText(tfield.getText() + "8");
z = 0;
}
}
if (s.equals("9")) {
if (z == 0) {
tfield.setText(tfield.getText() + "9");
}
else
{
tfield.setText("");
tfield.setText(tfield.getText() + "9");
z = 0;
}
}
if (s.equals("0"))
{
if (z == 0) {
tfield.setText(tfield.getText() + "0");
}
else
{
tfield.setText("");
tfield.setText(tfield.getText() + "0");
z = 0;
}
}
if (s.equals("AC")) {
tfield.setText("");
x = 0;
y = 0;
z = 0;
}
if (s.equals("log"))
{
if (tfield.getText().equals("")) {
tfield.setText("");
}
else
 {
a = Math.log(Double.parseDouble(tfield.getText()));
tfield.setText("");
tfield.setText(tfield.getText() + a);
}
}
```

```
if (s.equals("1/x")) {
if (tfield.getText().equals("")) {
tfield.setText("");
}
else
{
a = 1 / Double.parseDouble(tfield.getText());
tfield.setText("");
tfield.setText(tfield.getText() + a);
}
}
if (s.equals("Exp")) {
if (tfield.getText().equals("")) {
tfield.setText("");
}
else
{
a = Math.exp(Double.parseDouble(tfield.getText()));
tfield.setText("");
tfield.setText(tfield.getText() + a);
}
}
if (s.equals("x^2")) {
if (tfield.getText().equals("")) {
tfield.setText("");
}
else
{
a = Math.pow(Double.parseDouble(tfield.getText()), 2);
tfield.setText("");
tfield.setText(tfield.getText() + a);
}
}
if (s.equals("x^3")) {
if (tfield.getText().equals("")) {
tfield.setText("");
}
else
{
a = Math.pow(Double.parseDouble(tfield.getText()), 3);
tfield.setText("");
tfield.setText(tfield.getText() + a);
}
}
if (s.equals("+/-")) {
if (x == 0) {
tfield.setText("-" + tfield.getText());
x = 1;
}
else
{
tfield.setText(tfield.getText());
}
}
if (s.equals(".")) {
if (y == 0) {
tfield.setText(tfield.getText() + ".");
y = 1;
}
```

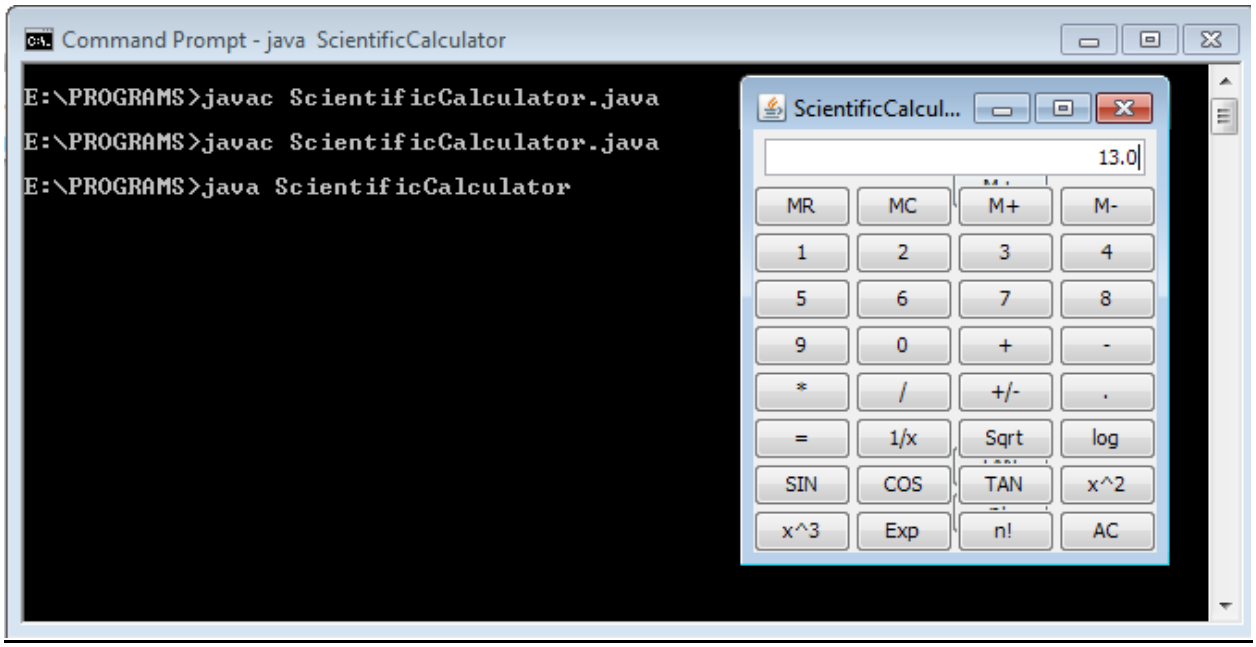
```
else
{
tfield.setText(tfield.getText());
}
}
if (s.equals("+"))
{
if (tfield.getText().equals(""))
{
tfield.setText("");
temp = 0;
ch = '+';
}
else
{
temp = Double.parseDouble(tfield.getText());
tfield.setText("");
ch = '+';
y = 0;
x = 0;
}
tfield.requestFocus();
}
if (s.equals("-"))
{
if (tfield.getText().equals(""))
{
tfield.setText("");
temp = 0;
ch = '-';
}
 else
 {
x = 0;
y = 0;
temp = Double.parseDouble(tfield.getText());
tfield.setText("");
ch = '-';
}
tfield.requestFocus();
}
if (s.equals("/")) {
if (tfield.getText().equals(""))
{
tfield.setText("");
temp = 1;
ch = '/';
}
else
{
x = 0;
y = 0;
temp = Double.parseDouble(tfield.getText());
ch = '/';
tfield.setText("");
}
tfield.requestFocus();
}
if (s.equals("*")) {
```

```
if (tfield.getText().equals(""))
{
tfield.setText("");
temp = 1;
ch = '*';
}
else
{
x = 0;
y = 0;
temp = Double.parseDouble(tfield.getText());
ch = '*';
tfield.setText("");
}
tfield.requestFocus();
}
if (s.equals("MC"))
{
m1 = 0;
tfield.setText("");
}
if (s.equals("MR"))
{
tfield.setText("");
tfield.setText(tfield.getText() + m1);
}
if (s.equals("M+"))
{
if (k == 1) {
m1 = Double.parseDouble(tfield.getText());
k++;
}
else
{
m1 += Double.parseDouble(tfield.getText());
tfield.setText("" + m1);
}
}
if (s.equals("M-"))
{
if (k == 1) {
m1 = Double.parseDouble(tfield.getText());
k++;
}
else
 {
m1 -= Double.parseDouble(tfield.getText());
tfield.setText("" + m1);
}
}
if (s.equals("Sqrt"))
{
if (tfield.getText().equals(""))
{
tfield.setText("");
}
else
{
a = Math.sqrt(Double.parseDouble(tfield.getText()));
```

```
tfield.setText("");
field.setText(tfield.getText() + a);
}
}
if (s.equals("SIN"))
{
if (tfield.getText().equals(""))
{
tfield.setText("");
}
else
{
a = Math.sin(Double.parseDouble(tfield.getText()));
tfield.setText("");
tfield.setText(tfield.getText() + a);
}
}
if (s.equals("COS"))
{
if (tfield.getText().equals(""))
{
tfield.setText("");
}
else
{
a = Math.cos(Double.parseDouble(tfield.getText()));
tfield.setText("");
tfield.setText(tfield.getText() + a);
}
}
if (s.equals("TAN")) {
if (tfield.getText().equals("")) {
tfield.setText("");
}
else
{
a = Math.tan(Double.parseDouble(tfield.getText()));
tfield.setText("");
tfield.setText(tfield.getText() + a);
}
}
if (s.equals("="))
{
if (tfield.getText().equals(""))
{
tfield.setText("");
}
else
{
temp1 = Double.parseDouble(tfield.getText());
switch (ch)
{
case '+':
result = temp + temp1;
break;
case '-':
result = temp - temp1;
break;
case '/':
```

```
result = temp / temp1;
break;
case '*':
result = temp * temp1;
break;
}
tfield.setText("");
tfield.setText(tfield.getText() + result);
z = 1;
}
}
if (s.equals("n!"))
{
if (tfield.getText().equals(""))
{
tfield.setText("");
}
else
{
a = fact(Double.parseDouble(tfield.getText()));
tfield.setText("");
tfield.setText(tfield.getText() + a);
}
}
tfield.requestFocus();
}
double fact(double x)
{
        int er = 0;
        if (x < 0)
        {
                er = 20;
                return 0;
        }
        double i, s = 1;
        for (i = 2; i <= x; i += 1.0)
                s *= i;
        return s;
}
        public static void main(String args[])
        {
            try
            {
            UIManager.setLookAndFeel("com.sun.java.swing.plaf.windows.WindowsLookAndFeel");
           }
           catch (Exception e)
           {
            }
           ScientificCalculator f = new ScientificCalculator();
           f.setTitle("ScientificCalculator");
           f.pack();
           f.setVisible(true);
      }
}
```

OUTPUT



RESULT

Thus the Java programs for scientific calculator has been implemented and executed successfully.

EX NO : 12 **MINI PROJECT**

DATE :

1. Airline Reservation System
2. Mark sheet Preparation system
3. NAAC online application creation
4. Library Management System
5. Converting RGB image to Gray Image
6. Health Care System
7. App development
8. Income Tax System
9. Vehicle Tracking System
10. Ebanking System

VIVA QUESTIONS

1. What are the principle concepts of OOPS?
2. What is Abstraction?
3. What is Encapsulation?
4. What is Inheritance?
5. What is Polymorphism?
6. Explain the different forms of Polymorphism?
7. Define a constructor?
8. Define Destructor?
9. What is JVM?
10. What is difference between Stream classes and Reader writer classes?
11. Explain the use of RandomAccessFile classes.
12. What is object Serialization? Explain the use of Persisting object.
13. What is the difference between procedural and object-oriented programs?
14. What is multithreading and what is the class in which these methods are defined?
15. What is the difference between applications and applets?
16. What is adapter class?
17. What is the difference between Process and Thread?
18. How do you declare a class as private?
19. What is the drawback of inheritance?
20. Why are there no global variables in Java?

General

1. What is garbage collection? How does it happen?
2. What is the difference between a constructor and a method?
3. What is a static block? How do you create a static block? Why is it used?
4. What are static variable, static method and static class?
5. What are final variable, final method and final class?
6. Why do we use finalize() method?

Abstract classes and interfaces

1. What is an abstract class?
2. What are the differences between abstract class and interface? Can you tell me examples where we use interface and abstract class?

Exception

1. What are the differences between “NullPointerException” and “Exception” classes?
2. What are the differences between exception and error classes?

String

1. What is the difference between “==” and “equals”
2. Can we extend String class?
3. What are the differences between String, StringBuffer and StringBuilder?