

Lab Program:

Develop a Java program that prints all real solutions to the quadratic equation  $ax^2 + bx + c = 0$ .

Read in a, b, c and use the quadratic formula. If the discriminant  $b^2 - 4ac$

is negative, display a

message stating that there are no real solutions.

```
USN: 1BM19CS137 Date : 02/10/2020
// Java program to find roots of a quadratic equation
import java.util.Scanner;
import static java.lang.Math.*;
class quadratic
{
public static void main(String args[])
{
Scanner sc = new Scanner(System.in);
System.out.print("Enter the value of a ::");
float a = sc.nextFloat();
System.out.print("Enter the value of b ::");
float b = sc.nextFloat();
System.out.print("Enter the value of c ::");
float c = sc.nextFloat();
if (a == 0)
{
System.out.println("Invalid");
return;
}
float d = b*b - 4*a*c;
float sqrt_val = (float)Math.sqrt(abs(d));
float root1= (-b + sqrt_val) / (2 * a);
float root2=(-b - sqrt_val) / (2 * a);
if(d == 0)
{
System.out.println("Roots are real and equal :: "+root1);
}
```

```

else if (d > 0)
{
    System.out.print("Roots are real and different \n");
    System.out.print(root1 + "\n"+ root2);
}
else
{
    System.out.print("Roots are complex \n");
    System.out.print( -b / ( 2 * a ) + " + i"+ sqrt_val +
"\n" + -b /( 2 * a )+ " - i" + sqrt_val);
}
}

```

```

PS D:\sem3\ooj_lab\09-10-2020> java quadratic
Enter the value of a ::1
Enter the value of b ::2
Enter the value of c ::1
Roots are real and equal :: -1.0
PS D:\sem3\ooj_lab\09-10-2020> java quadratic
Enter the value of a ::0
Enter the value of b ::2
Enter the value of c ::5
Invalid
PS D:\sem3\ooj_lab\09-10-2020> java quadratic
Enter the value of a ::2
Enter the value of b ::4
Enter the value of c ::4
Roots are complex
-1.0 + i1.0
-1.0 - i1.0
PS D:\sem3\ooj_lab\09-10-2020>

```

## Lab Program 2:

Develop a 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.

```
import java.util.Scanner;
class student{
    String usn , name;
    int credits[] = new int[10];
    int marks[]= new int[10];
    int i;
    float sgpa;
    Scanner in =new Scanner(System.in);
    void read_details()
    {
        System.out.print("Enter your name :");
        name = in.nextLine();
        System.out.print("Enter your USN :");
        usn = in.nextLine();
        System.out.print("Enter credits for each subject :");
        for (i=0;i<6 ;i++ ) {
            System.out.print("Subject "+(i+1)+" :");
            credits[i]= in.nextInt();
        }
        System.out.print("Enter marks in each subject :");
        for (i=0;i<6 ;i++ ) {
            System.out.print("Subject "+(i+1)+" :");
            marks[i]= in.nextInt();
        }
    }
    void display_details()
    { int i;
        System.out.println("the student details are :");
        System.out.println("Name :"+name);
        System.out.println("USN :"+usn);
```

```

        System.out.println("Credits for each subject :");
        for (i=0;i<6 ;i++ ) {
            System.out.println("Subject "+(i+1)+" credits
:"+credits[i]);
        }
        System.out.println("Marks in each subject :");
        i=0;
        for (i=0;i<6 ;i++ ) {
            System.out.println("Subject "+(i+1)+" marks
:"+marks[i]);
        }
        calc_sgpa();
        System.out.println("Sgpa :"+sgpa);
    }
    void calc_sgpa()
    {
        float sumgp=0;
        float sumcred=0;
        int gp=0;
        for (i=0;i<6 ;i++ )
        {
            if (marks[i]>=90) gp=10;
            else if(marks[i]>=80) gp=9;
            else if(marks[i]>=70) gp=8;
            else if(marks[i]>=60) gp=7;
            else if(marks[i]>=50) gp=6;
            else gp=5;
            sumgp=sumgp+(gp*credits[i]);
            sumcred=sumcred+credits[i];
        }

        sgpa=(sumgp/sumcred);
    }
}
class student_main
{
    public static void main(String[] args)
    {

```

```
        student s= new student();  
        s.read_details();  
        s.display_details();  
    }  
}
```

```
PS D:\sem3\ooj_lab\09-10-2020> javac .\student_main.java  
PS D:\sem3\ooj_lab\09-10-2020> java student_main  
Enter your name :qwerty  
Enter your USN :123  
Enter credits for each subject :Subject 1 :2  
Subject 2 :4  
Subject 3 :4  
Subject 4 :4  
Subject 5 :4  
Subject 6 :5  
Enter marks in each subject :Subject 1 :45  
Subject 2 :56  
Subject 3 :67  
Subject 4 :78  
Subject 5 :89  
Subject 6 :90  
the student details are :  
Name :qwerty  
USN :123  
Credits for each subject :  
Subject 1 credits :2  
Subject 2 credits :4  
Subject 3 credits :4  
Subject 4 credits :4  
Subject 5 credits :4  
Subject 6 credits :5  
Marks in each subject :  
Subject 1 marks :45  
Subject 2 marks :56  
Subject 3 marks :67  
Subject 4 marks :78  
Subject 5 marks :89  
Subject 6 marks :90  
Sgpa :7.826087  
PS D:\sem3\ooj_lab\09-10-2020>
```

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

```
import java.util.Scanner;
class book{
    String title,author;
    int no_of_pages;
    float price;
    Scanner in =new Scanner(System.in);
    book()
    {
        System.out.print("Enter book title :");
        title= in.nextLine();
        System.out.print("Author :");
        author= in.nextLine();
        System.out.print("Number of pages :");
        no_of_pages= in.nextInt();
        System.out.print("Price :");
        price= in.nextFloat();
    }
    public String toString()
    {
        return ("Book title : "+title+"\nAuthor :
"+author+"\nNumber of pages : "+no_of_pages+"\nPrice :
"+price);
    }
}
class books{
    public static void main(String[] args)
    {
        book[] b=new book[3];
        int i;
        for (i=0;i<3 ;i++)
        {
            System.out.println("Enter book "+(i+1)+" details:");
            b[i]=new book();
        }
    }
}
```

```

        System.out.println();
    }
    for (i=0;i<3 ;i++)
    {
        System.out.println("The book"+(i+1)+" details:");
        System.out.println(b[i]);
        System.out.println();
    }
}
}

```

```

PS C:\Users\HP> cd D:\sem3\ooj_lab\16-10-2020
PS D:\sem3\ooj_lab\16-10-2020> javac .\books.java
PS D:\sem3\ooj_lab\16-10-2020> java books
Enter book 1 details:
Enter book title :q
Author :w
Number of pages :2
Price :3

Enter book 2 details:
Enter book title :a
Author :s
Number of pages :4
Price :6

Enter book 3 details:
Enter book title :z
Author :x
Number of pages :56
Price :78

The book1 details:
Book title : q
Author : w
Number of pages : 2
Price : 3.0

The book2 details:
Book title : a
Author : s
Number of pages : 4
Price : 6.0

The book3 details:
Book title : z
Author : x
Number of pages : 56
Price : 78.0

PS D:\sem3\ooj_lab\16-10-2020> 

```

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.

```
abstract class shape {
    int dim1;
    int dim2;
    shape(int a, int b) {
        dim1 = a;
        dim2 = b;
    }
    abstract void area() ;
}
class Rectangle extends shape {
    Rectangle(int a, int b) {
        super(a, b);
    }
    void area() {
        double area = dim1 * dim2;
        System.out.println("Area of Rectangle is "+area);
    }
}
class Triangle extends shape {
    Triangle(int a, int b) {
        super(a, b);
    }
    void area() {
        double area=dim1 * dim2 / 2;
        System.out.println("Area of Triangle is "+area);
    }
}
```

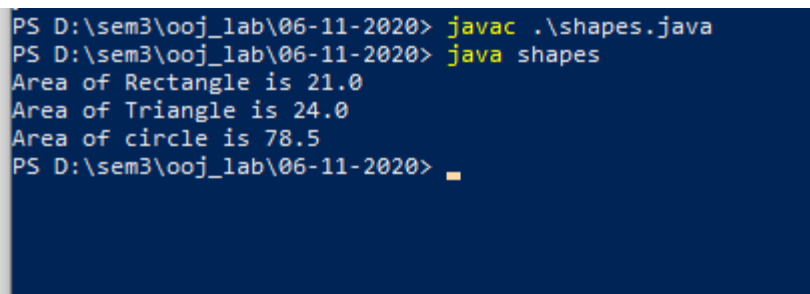


```

class Circle extends shape {
    Circle(int a, int b) {
        super(a, b);
    }
    void area() {
        double area = dim1 * dim1 *3.14;
        System.out.println("Area of circle is "+area);
    }
}
class shapes {
    public static void main(String args[]) {
        Rectangle r = new Rectangle(7, 3);
        Triangle t = new Triangle(6,8 );
        Circle c = new Circle(5,5);
        shape s;
        s = r;
        s.area();
        s = t;
        s.area();
        s = c;
        s.area();
    }
}

```

OUTPUT:



```

PS D:\sem3\ooj_lab\06-11-2020> javac .\shapes.java
PS D:\sem3\ooj_lab\06-11-2020> java shapes
Area of Rectangle is 21.0
Area of Triangle is 24.0
Area of circle is 78.5
PS D:\sem3\ooj_lab\06-11-2020> 

```

```

/*
    Rectangle r = new Rectangle(9, 8);
    Triangle t = new Triangle(10,15 );
    Circle c = new Circle(7,7);
*/

```

```
PS D:\sem3\ooj_lab\06-11-2020> javac .\shapes.java
PS D:\sem3\ooj_lab\06-11-2020> java shapes
Area of Rectangle is 72.0
Area of Triangle is 75.0
Area of circle is 153.86
PS D:\sem3\ooj_lab\06-11-2020>
```

\*\*\*\*\*

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 Curr-acct and Sav-acct to make them more specific to their requirements. Include the necessary methods in order to achieve the following tasks:

- Accept deposit from customer and update the balance.
- Display the balance.
- Compute and deposit interest
- Permit withdrawal and update the balance
- Check for the minimum balance, impose penalty if necessary and update the balance

```
class account{
    String name , acc_no ,acc_type;
    double balance;
    account(String name,String acc_no, String acc_type){
        this.name=name;
        this.acc_no=acc_no;
        this.acc_type=acc_type;
        balance=0;
    }
    void deposit(double amt){
        System.out.println("balance : "+balance);
        balance+=amt;
        System.out.println("updated balance : "+balance);
    }
    void withdraw(double amt){
        System.out.println("balance : "+balance);
        balance-=amt;
        System.out.println("updated balance : "+balance);
    }
}
```

```

    }
}
class curr_acct extends account{
    curr_acct(String name,String acc_no, String acc_type){
        super(name,acc_no,acc_type);
    }
    double service= 100;
    double min_bal=3000;
    int charged=0;
    void check(){
        if(balance<min_bal&& charged==0){
            balance-=service;
            charged=1;
            System.out.println(service+" deducted due to low
balance");
        }
        if(charged==1)
        {
            System.out.println("your balance is low to avoid
beign fined again increase your balance");
        }
    }
    void disp_bal(){
        check();
        System.out.println("your account balance is
"+balance);
    }
}
class sav_acct extends account{
    sav_acct(String name,String acc_no, String acc_type){
        super(name,acc_no,acc_type);
    }
    int given=0;
    void interest(){
        if (balance>10000 && given==0) {
            balance+=0.007*balance;
            System.out.println("your account has been credited
with o.7% interest ");
            given+=1;
        }
    }
}

```

```

    }
    if (balance>100000 && given==1) {
        balance+=0.005*balance;
        System.out.println("your account has been credited
with 0.5% interest ");
        given+=1;
    }
    if (balance>1000000 && given==2) {
        balance+=0.002*balance;
        System.out.println("your account has been credited
with 0.2% interest ");
        given+=1;
    }

}
void disp_bal(){
    interest();
    System.out.println("your account balance is
"+balance);
}

}
class bank{
    public static void main(String[] args) {
        sav_acct sav = new sav_acct("A","1b","savings");
        System.out.println("savings account functions:");
        sav.deposit(11000);
        sav.disp_bal();
        sav.withdraw(5000);
        curr_acct cur = new curr_acct("B","2b","current");
        System.out.println("current account functions:");
        cur.deposit(5000);
        cur.withdraw(2500);
        cur.disp_bal();
    }
}

```

OUTPUT:

```
PS D:\sem3\ooj_lab\06-11-2020> javac .\bank.java
PS D:\sem3\ooj_lab\06-11-2020> java bank
savings account functions:
balance : 0.0
updated balance : 11000.0
your account has been credited with 0.7% interest
your account balance is 11077.0
balance : 11077.0
updated balance : 6077.0
current account functions:
balance : 0.0
updated balance : 5000.0
balance : 5000.0
updated balance : 2500.0
100.0 deducted due to low balance
your balance is low to avoid beign fined again increase your balance
your account balance is 2400.0
PS D:\sem3\ooj_lab\06-11-2020> javac .\shapes.java
```

\*\*\*\*\*

## **PACKAGE LAB PROGRAM**

*student.java*

```
package cie;
import java.util.*;
public class student
{
    public String usn;
    public String name;
    public int sem;

    public void read()
    {
        Scanner sc=new Scanner(System.in);
        System.out.print("Enter usn of the student : ");
        usn=sc.next();
        System.out.print("Enter name of the student : ");
        name=sc.next();
        System.out.print("Enter semester of the student : ");
        sem=sc.nextInt();
    }
}
```

*internals.java*

```
package cie;
import java.util.*;

public class internals extends student
{
    public int[] cie_m=new int[3];

    public void read()
```

```

{
    super.read();
    Scanner sc=new Scanner(System.in);
    System.out.println("Enter the CIE marks : ");
    for(int i=0;i<3;i++)
    {
        System.out.print("Enter marks of the course " + (i+1)+" : ");
        cie_m[i]=sc.nextInt();
    }
}
public void display()
{
    System.out.println("USN of the student is " + usn);
    System.out.println("Name of the student is " + name);
    System.out.println("Semester of the student is " + sem);
}
}

```

*externals.java*

```

package see;
import java.util.*;
import java.io.*;
import java.lang.*;

public class external extends cie.student
{
    public int[] see_m=new int[3];
    public int[] mar;
    public void read()
    {

```



```

        Scanner sc=new Scanner(System.in);
        System.out.println("Enter the SEE marks : ");
        for(int i=0;i<3;i++)
        {
            System.out.print("Enter the SEE marks of the course " +
(i+1)+" : ");
            see_m[i]=sc.nextInt();
        }
    }
}

```

*main\_stu.java*

```

import java.util.*;
import java.io.*;
import java.lang.*;
import cie.*;
import see.*;

```

```

public class student_end
{
    public static void main(String[] args)
    {
        int n;
        Scanner sc=new Scanner(System.in);
        int final_mark;
        System.out.print("Enter the Number of students : ");
        n=sc.nextInt();
        internals[] in=new internals[n];
        external[] ex=new external[n];
        internals ob1=new internals();
        external ob2=new external();
    }
}

```

```

        ob2.mar=new int[n];

        for(int i=0;i<n;i++)
        {
            System.out.println("Enter the details of the student " +
(i+1)+" ": ");
            in[i]=new internals();
            in[i].read();
            ex[i]=new external();
            ex[i].read();
        }
        System.out.println();
        for(int i=0;i<n;i++)
        {
            System.out.println("Details Of The Student " + (i+1));
            System.out.println("USN of the student is " +
in[i].usn);
            System.out.println("Name of the stuednt is " +
in[i].name);
            System.out.println("Semester of the student is " +
in[i].sem);

            for(int j=0;j<3;j++)
            {
                final_mark=in[i].cie_m[j]+((ex[i].see_m[j])/2);
                System.out.println("Final Mark of the student " +
(i+1) + " " + " in course " + (j+1) + " " + final_mark);

            }
            System.out.println();
        }

    }

}

```

OUTPUT:

```
Windows PowerShell
PS D:\sem3\ooj_lab\20-11-2020\lab9> javac .\student_end.java
PS D:\sem3\ooj_lab\20-11-2020\lab9> java student_end
Enter the Number of students : 2
Enter the details of the student 1:
Enter usn of the student : 1
Enter name of the student : q
Enter semester of the student : 2
Enter the CIE marks :
Enter marks of the course 1: 34
Enter marks of the course 2: 36
Enter marks of the course 3: 38
Enter the SEE marks :
Enter the SEE marks of the course 1: 78
Enter the SEE marks of the course 2: 80
Enter the SEE marks of the course 3: 90
Enter the details of the student 2:
Enter usn of the student : 2
Enter name of the student : w
Enter semester of the student : 2
Enter the CIE marks :
Enter marks of the course 1: 34
Enter marks of the course 2: 39
Enter marks of the course 3: 40
Enter the SEE marks :
Enter the SEE marks of the course 1: 89
Enter the SEE marks of the course 2: 78
Enter the SEE marks of the course 3: 88

Details Of The Student 1
USN of the student is 1
Name of the student is q
Semester of the student is 2
Final Mark of the student 1 in course 1 73
Final Mark of the student 1 in course 2 76
Final Mark of the student 1 in course 3 83

Details Of The Student 2
USN of the student is 2
Name of the student is w
Semester of the student is 2
Final Mark of the student 2 in course 1 78
Final Mark of the student 2 in course 2 78
Final Mark of the student 2 in course 3 84

PS D:\sem3\ooj_lab\20-11-2020\lab9> _
```

\*\*\*\*\*

## Program 7

1. Write a program to demonstrate generics with multiple object parameters.

```
import java.io.*;
import java.lang.*;
import java.util.*;

class gen<T>
{
    T ob;
    gen(T o)
    {
        ob=o;
    }
    T getob()
    {
        return ob;
    }
    void showtype()
    {
        System.out.println("Type of T is " +
ob.getClass().getName());
    }
}

class generic
{
    public static void main(String[] args)
    {
        String n;
        Scanner sc=new Scanner(System.in);
        System.out.println("Enter the Integer Number to Be
Displayed Using the generic style");
        n=sc.next();
        gen<Integer> ob1=new gen<Integer>(Integer.parseInt(n));
        ob1.showtype();
        int val=ob1.getob();
        System.out.println("Value is: " + val);

        System.out.println();

        System.out.println("Enter the String to Be Displayed
Using the generic style");
        n=sc.next();
        gen<String> ob2=new gen<String>(n);
        ob2.showtype();
        String x=ob2.getob();
        System.out.println("Value : " + x);
    }
}
```

```

        System.out.println();

        System.out.println("Enter the Double Number to Be
Displayed Using the generic style");
        n=sc.next();
        gen<Double> ob3=new gen<Double>(Double.parseDouble(n));
        ob3.showtype();
        double ans=ob3.getob();
        System.out.println("Value : " + ans);

    }
}

```

Output

```

Windows PowerShell
PS D:\sem3\ooj_lab\27-11-20> javac .\generic.java
PS D:\sem3\ooj_lab\27-11-20> java generic
Enter the Integer Number to Be Displayed Using the generic style
12
Type of T is java.lang.Integer
Value is: 12

Enter the String to Be Displayed Using the generic style
qwerty
Type of T is java.lang.String
Value : qwerty

Enter the Double Number to Be Displayed Using the generic style
3.1416
Type of T is java.lang.Double
Value : 3.1416
PS D:\sem3\ooj_lab\27-11-20>

```

\*\*\*\*\*

## Program 8

2. 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.

```
import java.util.*;

class WrongAge extends Exception {
    int detail;
    WrongAge(int a) {
        detail = a;
    }
    public String toString() {
        return "enter correct age "+detail+" is invalid";
    }
}

class father{
    public int age;
    Scanner in =new Scanner(System.in);
    father() throws WrongAge{
        System.out.print("Enter the father's age :");
        age= in.nextInt();
        if(age<0)
            throw new WrongAge(age);
    }
}

class son extends father{
    Scanner in =new Scanner(System.in);
    int fage;
    son(father f) throws WrongAge{
        this.fage=f.age;
        System.out.print("Enter the son's age :");
        this.age= in.nextInt();
    }
}
```

```

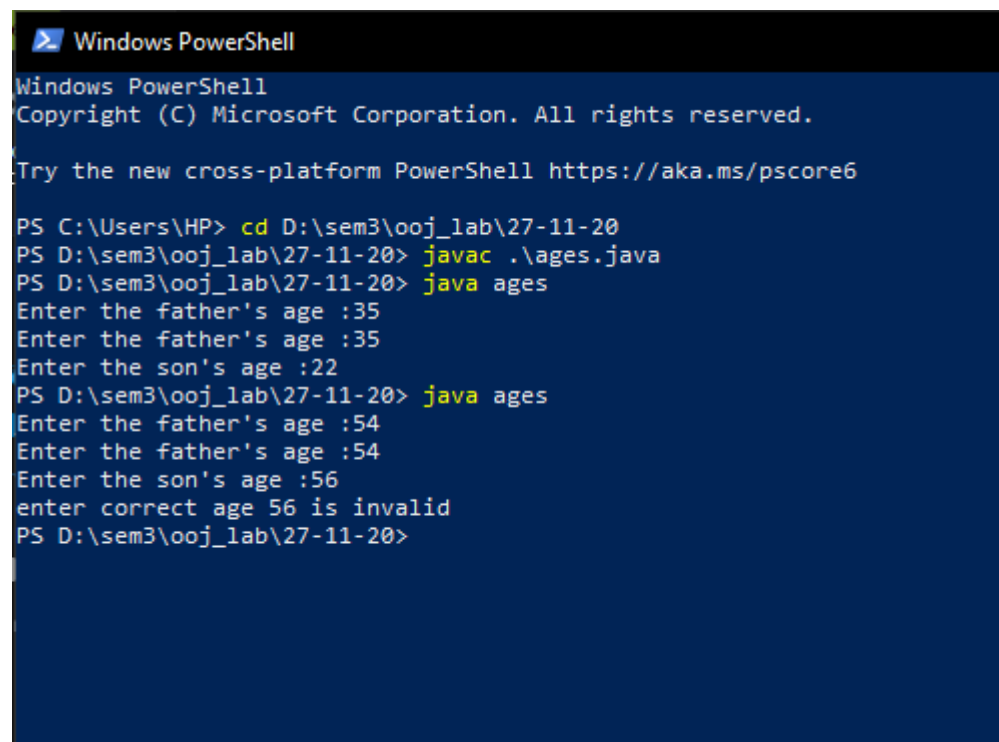
        if(this.age<0)
            throw new WrongAge(age);
        if(this.age>f.age)
            throw new WrongAge(age);
    }

}

class ages{
    public static void main(String[] args){
        try{
            father f= new father();
            son s= new son(f);
        }
        catch(Exception e){
            System.out.println(e);
        }
    }
}

```

Output:



```

Windows PowerShell
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Try the new cross-platform PowerShell https://aka.ms/pscore6

PS C:\Users\HP> cd D:\sem3\ooj_lab\27-11-20
PS D:\sem3\ooj_lab\27-11-20> javac .\ages.java
PS D:\sem3\ooj_lab\27-11-20> java ages
Enter the father's age :35
Enter the father's age :35
Enter the son's age :22
PS D:\sem3\ooj_lab\27-11-20> java ages
Enter the father's age :54
Enter the father's age :54
Enter the son's age :56
enter correct age 56 is invalid
PS D:\sem3\ooj_lab\27-11-20>

```

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**LAB PROGRAM:** 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.

```
class NewThread implements Runnable {
    Thread t;
    NewThread() {
        t = new Thread(this, "Demo Thread");
        t.start();
    }
    public void run() {
        try {
            for(int i = 25; i > 0; i--) {
                System.out.println("CSE");
                Thread.sleep(2000);
            }
        } catch (InterruptedException e) {
            System.out.println("thread2 interrupted.");
        }
        System.out.println("Exiting thread2.");
    }
}

class Thread1 {
    public static void main(String args[]) {
        new NewThread();
        try {
            for(int i = 5; i > 0; i--) {
                System.out.println("BMS College of Engineering");
                Thread.sleep(10000);
            }
        } catch (InterruptedException e) {
            System.out.println("Main thread interrupted.");
        }
        System.out.println("Main thread exiting.");
    }
}
```

OUTPUT:

```
Windows PowerShell
PS D:\sem3\ooj_lab\11-12-2020> javac .\Thread1.java
PS D:\sem3\ooj_lab\11-12-2020> java Thread1
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
Main thread exiting.
Exiting thread2.
PS D:\sem3\ooj_lab\11-12-2020>
```

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