VISVESVARAYA TECHNOLOGICAL UNIVERSITY

“JnanaSangama”, Belgaum -590014, Karnataka.

LAB REPORT
on

Object Oriented Java Programming (22CS3PCOOJ)

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
(Autonomous Institution under VTU)
BENGALURU-560019
October-2022 to Feb-2023

B. M. S. College of Engineering,

Bull Temple Road, Bangalore 560019

(Affiliated To Visvesvaraya Technological University, Belgaum)

Department of Computer Science and Engineering

CERTIFICATE

This is to certify that the Lab work entitled “Object Oriented Java Programming (22CS3PCOOJ)” carried out by **ADITYA S HUDDAR (1BM21CS007),** who is bonafide student of **B. M. S. College of Engineering.** It is in partial fulfillment for the award of **Bachelorof Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum during the year 2022. The Lab report has been approved as it satisfies the academic requirements in respect of a Object Oriented Java Programming(22CS3PCOOJ) work prescribed for the said degree.

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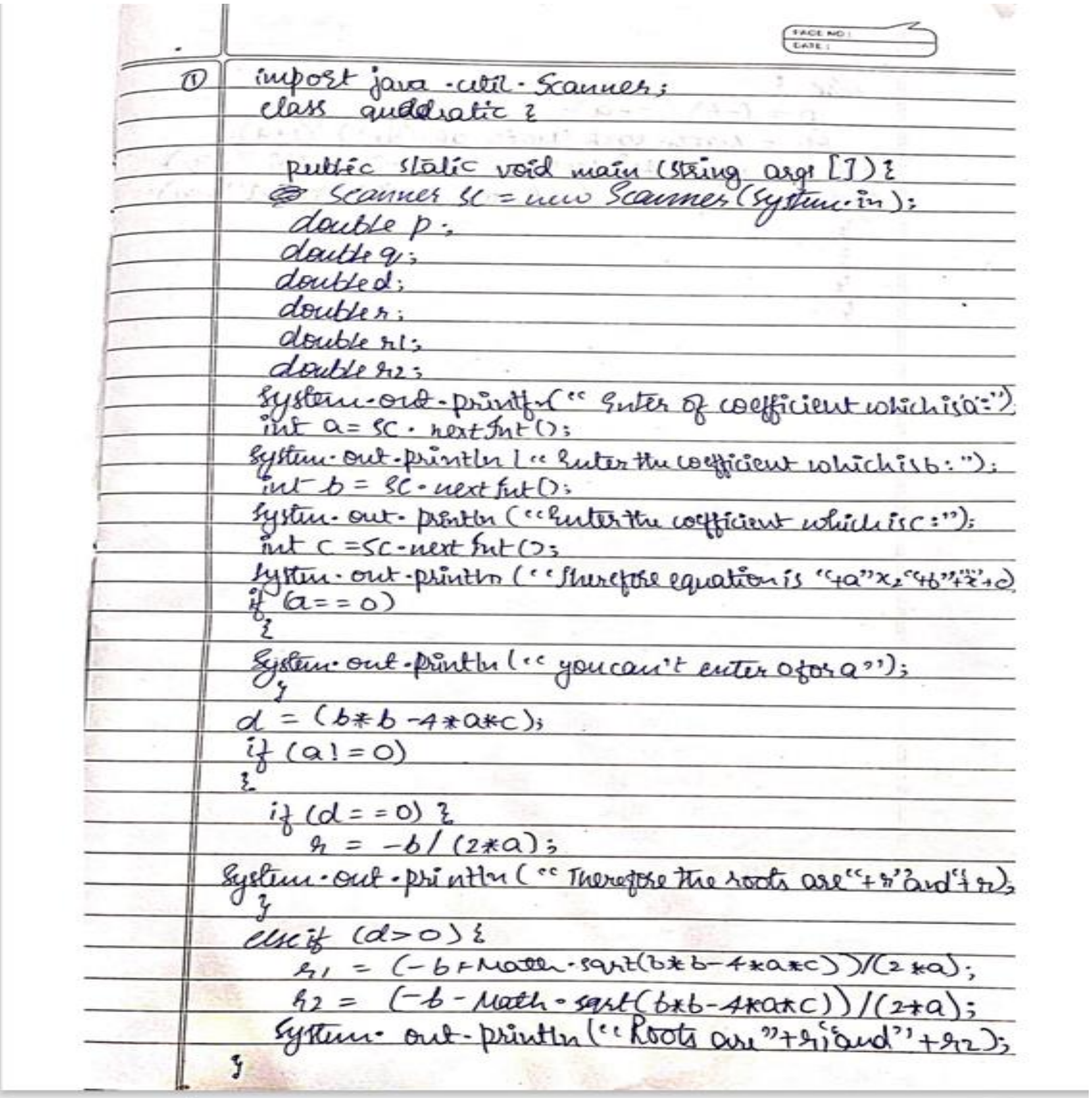
1) Develop a Java program that prints all real solutions to the quadratic equation ax2+bx+c = 0. Read in a, b, c and use the quadratic formula. If the discriminate b2-4ac is negative, display a message stating that there are no real solutions.



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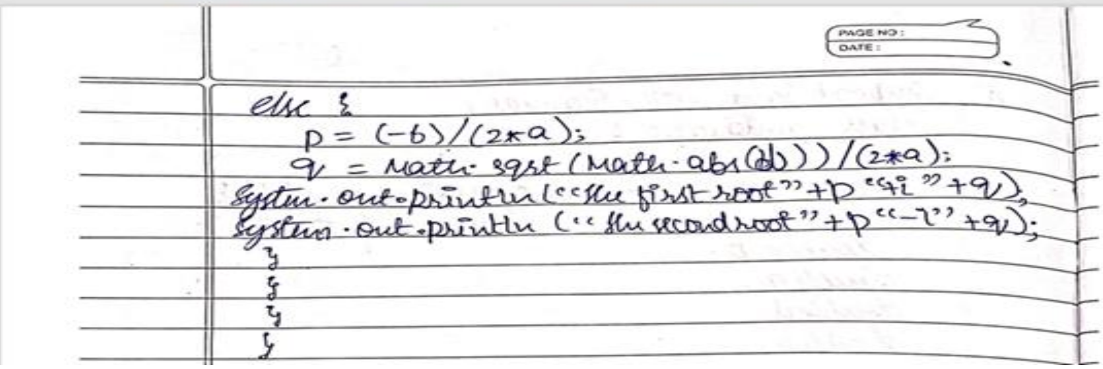
```
① import java.util.Scanner;
  class quddratic {

    public static void main (String args [] ) {
    Scanner sc = new Scanner(System.in);
     double p;
     double q;
     double d;
     double r;
     double r1;
     double r2;
    System.out.printf(" Enter of coefficient which is a:")
    int a= sc.nextInt();
   System.out.println (" Enter the coefficient which is b:");
    int b = sc.nextInt();
   System.out.println (" Enter the coefficient which is c:");
    int c =sc.nextInt();
   System.out.println (" Therefore equation is "+a"x2"+b"+"x"+c)
   if (a==0)
   {
   System.out.println (" you can't enter 0 for a");
    }
   d = (b*b -4*a*c);
   if (a!=0)
   {
     if (d==0) {
       r = -b/ (2*a);
  System.out.println (" Therefore the roots are "+r" and "+r);
    }
    else if (d>0) {
      r1 = (-b+Math.sqrt(b*b-4*a*c))/(2*a);
      r2 = (-b-Math.sqrt(b*b-4*a*c))/(2*a);
     System.out.println (" Roots are "+r1" and "+r2);
  }
```



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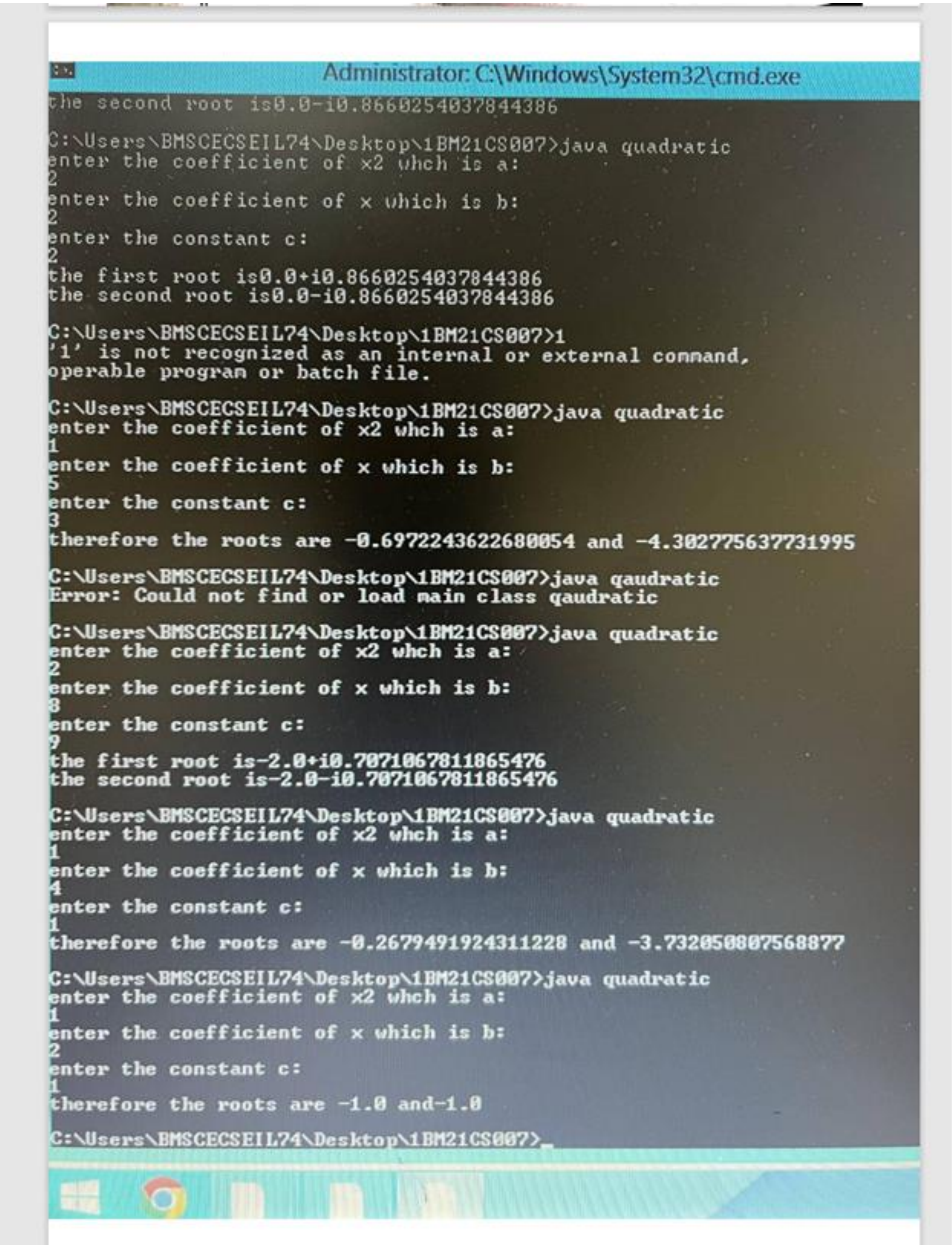
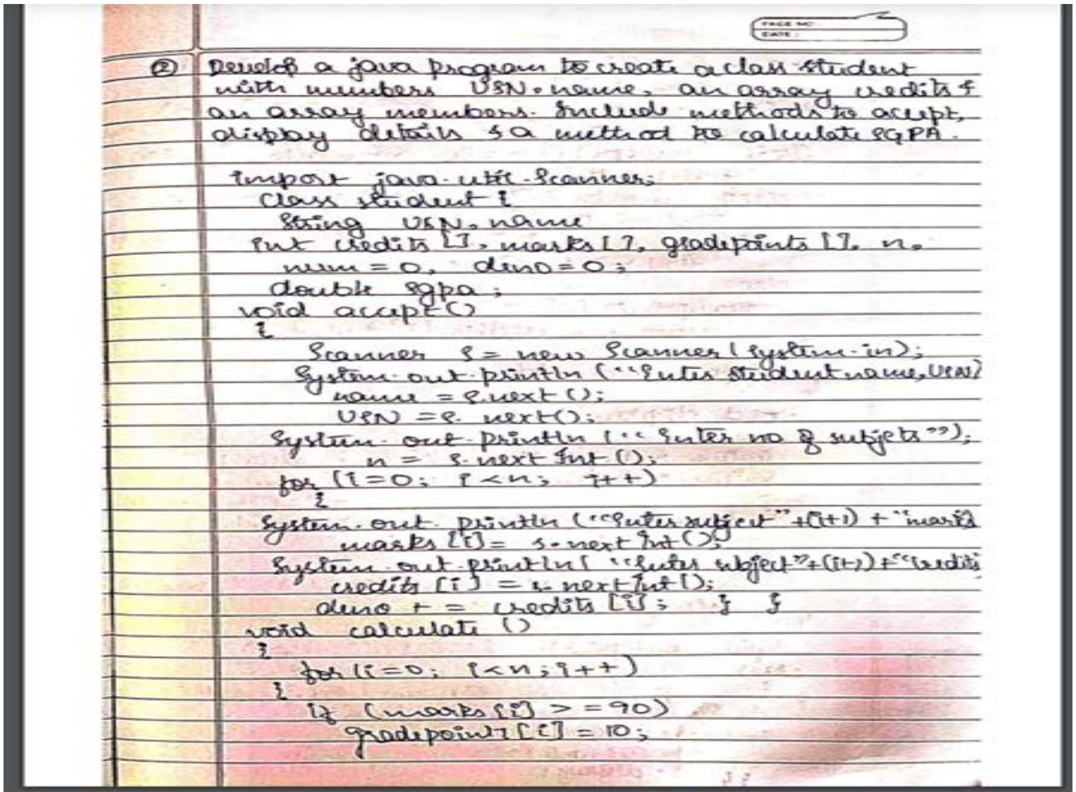
```
  else {
     p = (-b)/(2*a);
     q = Math.sqrt (Math.abs(d)))/(2*a);
 System.out.println(" The first root"+p "+i"+q),
 System.out.println (" The second root"+p"-i"+q);
   }
   }
   }
   }
```

OUTPUT:



```
the second root is0.0-i0.8660254037844386

C:\Users\BMSCECSEIL74\Desktop\1BM21CS007>java quadratic
enter the coefficient of x2 whch is a:
2
enter the coefficient of x which is b:
2
enter the constant c:
2
the first root is0.0+i0.8660254037844386
the second root is0.0-i0.8660254037844386

C:\Users\BMSCECSEIL74\Desktop\1BM21CS007>1
'1' is not recognized as an internal or external command,
operable program or batch file.

C:\Users\BMSCECSEIL74\Desktop\1BM21CS007>java quadratic
enter the coefficient of x2 whch is a:
1
enter the coefficient of x which is b:
5
enter the constant c:
3
therefore the roots are -0.6972243622680054 and -4.302775637731995

C:\Users\BMSCECSEIL74\Desktop\1BM21CS007>java qaudratic
Error: Could not find or load main class qaudratic

C:\Users\BMSCECSEIL74\Desktop\1BM21CS007>java quadratic
enter the coefficient of x2 whch is a:
2
enter the coefficient of x which is b:
8
enter the constant c:
9
the first root is-2.0+i0.7071067811865476
the second root is-2.0-i0.7071067811865476

C:\Users\BMSCECSEIL74\Desktop\1BM21CS007>java quadratic
enter the coefficient of x2 whch is a:
1
enter the coefficient of x which is b:
4
enter the constant c:
1
therefore the roots are -0.2679491924311228 and -3.732050807568877

C:\Users\BMSCECSEIL74\Desktop\1BM21CS007>java quadratic
enter the coefficient of x2 whch is a:
1
enter the coefficient of x which is b:
2
enter the constant c:
1
therefore the roots are -1.0 and-1.0

C:\Users\BMSCECSEIL74\Desktop\1BM21CS007>_
```

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.



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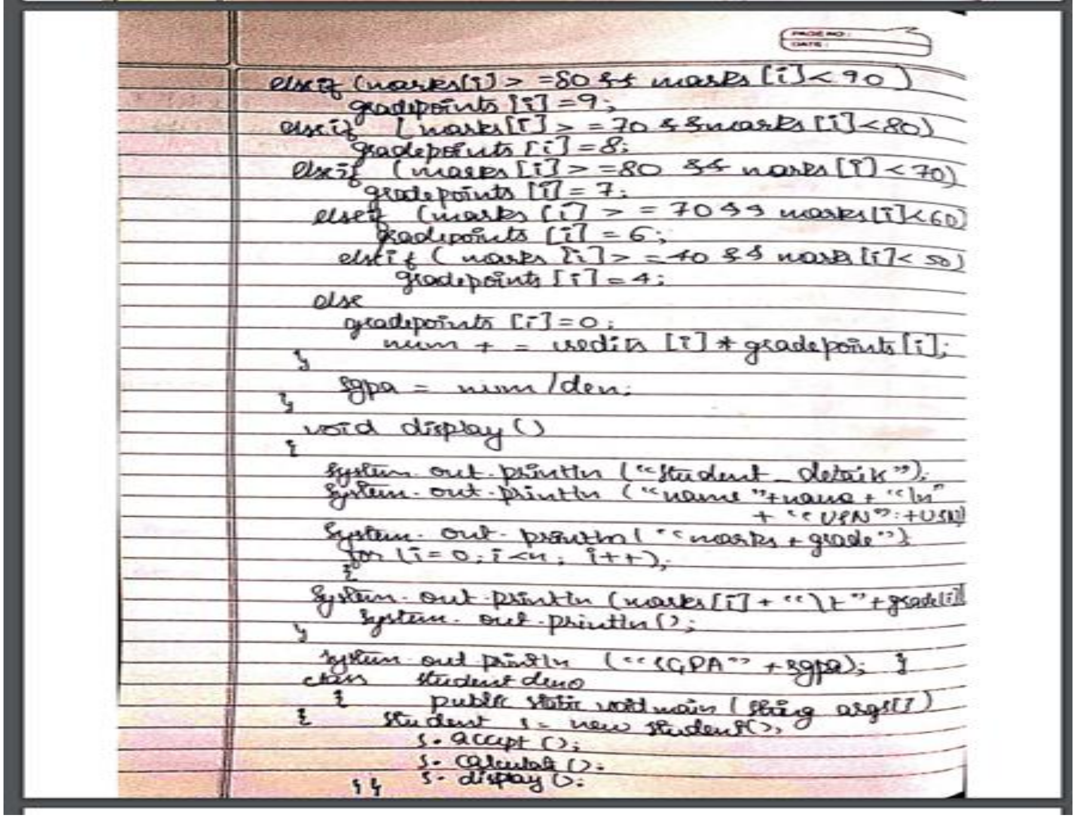
② Develop a java program to create a class student with members USN, name, an array credits & an array members. Include methods to accept, display details & a method to calculate SGPA.

```
import java.util.Scanner;
 Class student {
  String  USN, name
 int credits [], marks [], gradepoints [], n,
   num = 0,   deno = 0;
  double sgpa;
void accept()
 {
    Scanner s = new Scanner(System.in);
   System.out.println ("Enter student name, USN)
     name = s.next();
     USN = s. next();
  System.out.println ("Enter no of subjects");
      n =  s.next Int ();
  for (i=0;  i<n;  i++)
    {
 System.out. println ("Enter subject" +(i+1) + "marks")
      marks [i]=  s.next Int();
 System.out.println( "Enter subject"+(i+1)+"credits"
     credits [i] = s.next Int();
    deno + =  credits [i];    }  }
void  calculate ()
 {
   for (i=0;  i<n; i++)
  {
   if  (marks [i] > =90)
     gradepoints [i] = 10;
```



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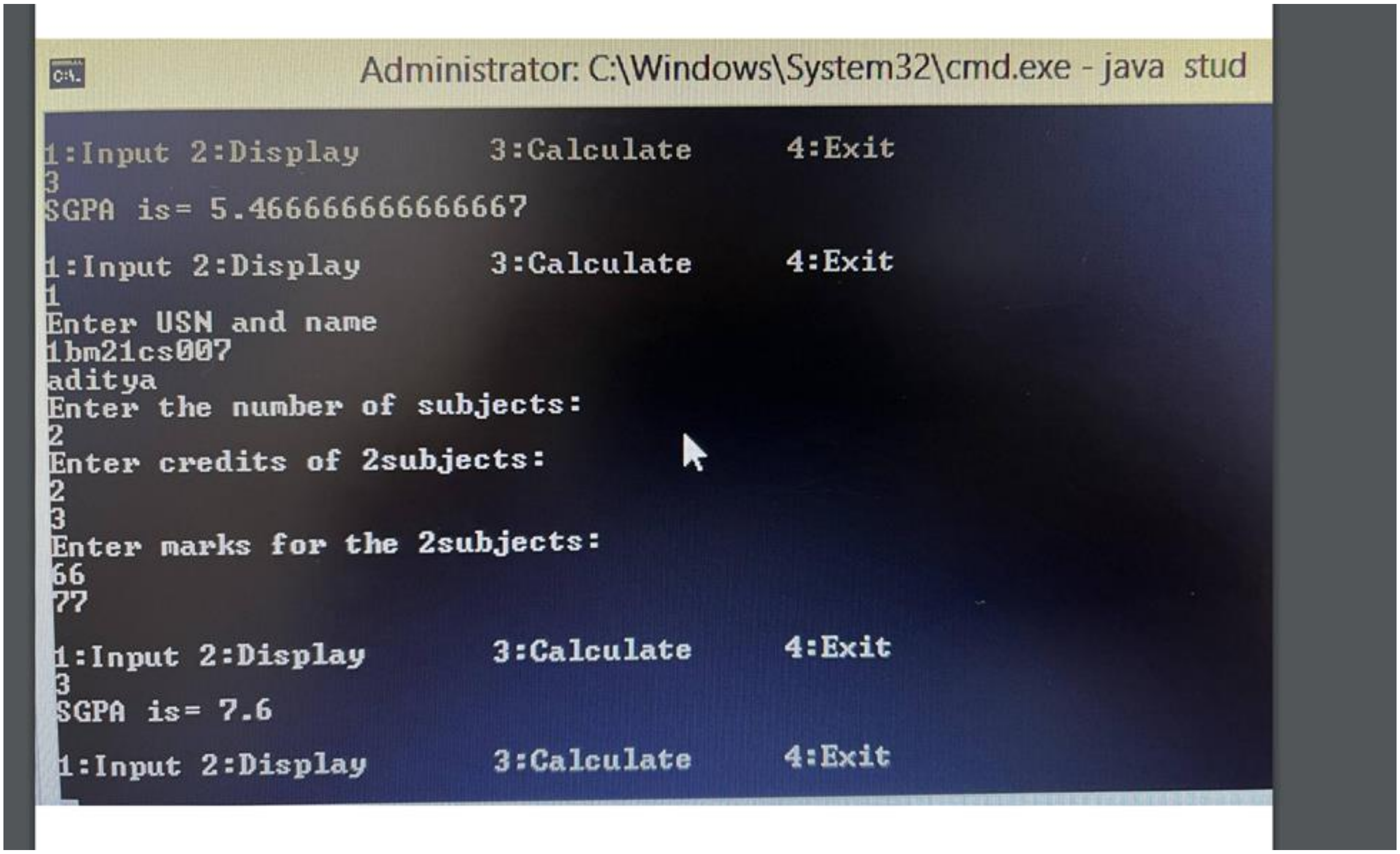
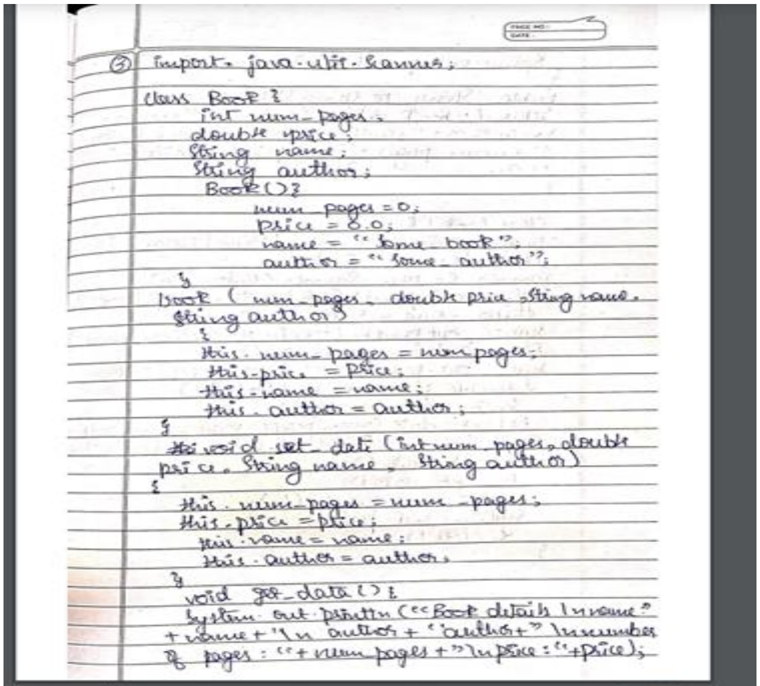
```
elseif (marks[i] > =80 && marks [i]<90 )
      gradepoints [i] =9;
elseif   [marks[i] > =70 &&marks [i]<80)
     gradepoints [i] =8;
 Elseif  (marks [i]> =80  && marks [i] <70)
     gradepoints [i]= 7;
  elseif  (marks [i] > = 70&& marks[i]<60)
      gradepoints  [i] = 6;
   elseif ( marks [i]> =40 && marks [i]< 50)
       gradepoints [i]= 4;
 else
   gradepoints  [i]=0;
      num + = credits [i] * gradepoints [i];
 }
   sgpa =  num /den;
}
 void  display ()
{
  System.out.println ("Student_details");
  System.out.println ("name "+name + "\n"
                                 + "USN": +USN)
  System. out. println( "marks + grade")
   for (i=0; i<n;  i++);
   {
 System.out.println (marks [i] + "\t" + grade[i])
    System. out.println();
 }
  System.out.println  ("SGPA" +sgpa);  }
class    student demo
  {       public static void main (String args[])
{      Student  s = new Student();
          s. accept ();
          s. calculate ();
   }}     s. display ();
```

OUTPUT:

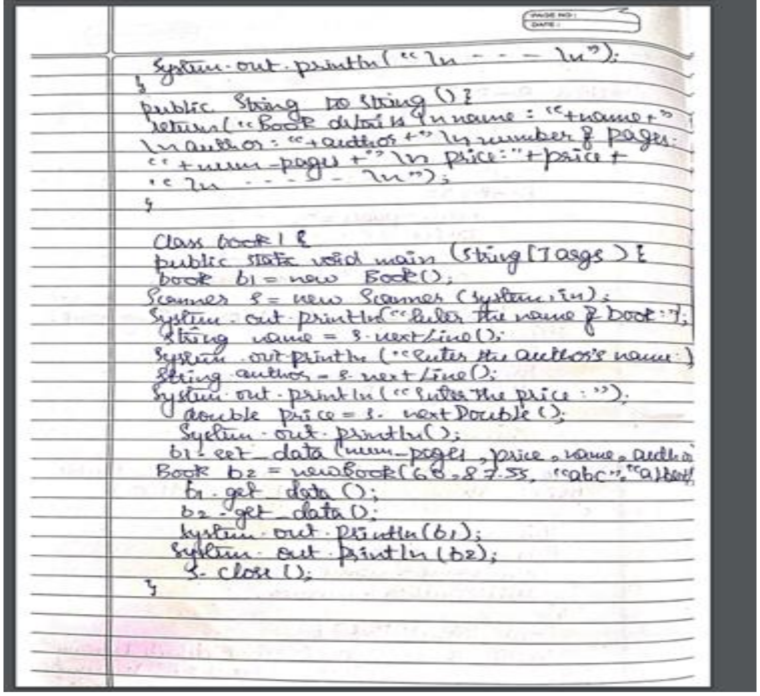


```
1:Input 2:Display       3:Calculate     4:Exit
3
SGPA is= 5.466666666666667

1:Input 2:Display       3:Calculate     4:Exit
1
Enter USN and name
1bm21cs007
aditya
Enter the number of subjects:
2
Enter credits of 2subjects:
2
3
Enter marks for the 2subjects:
66
77

1:Input 2:Display       3:Calculate     4:Exit
3
SGPA is= 7.6

1:Input 2:Display       3:Calculate     4:Exit
```

3) 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.

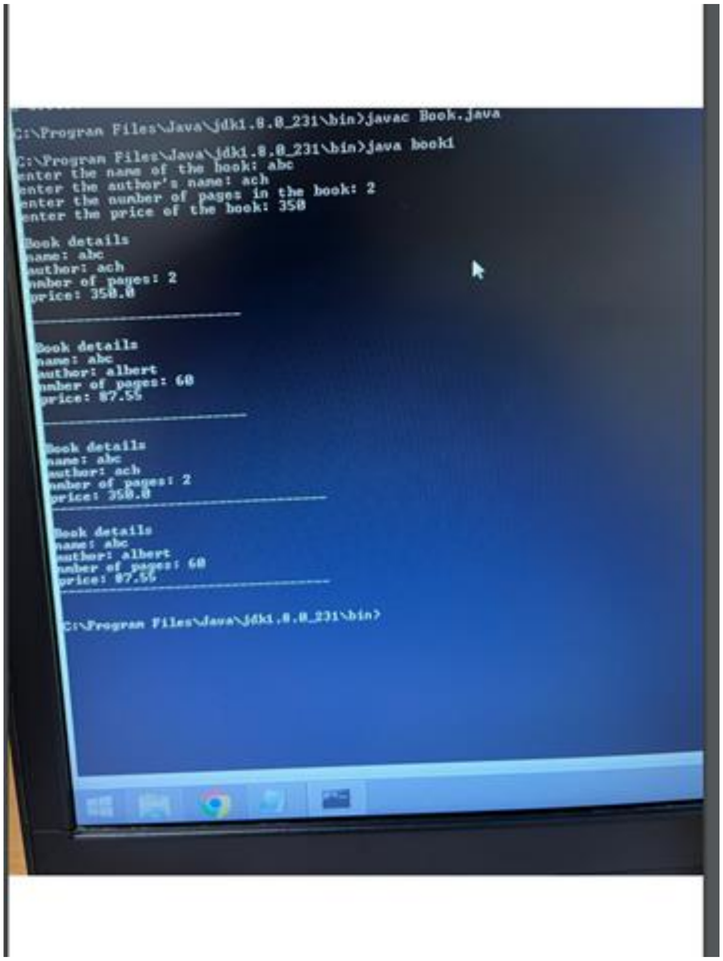


```
③ import java.util.Scanner;
class Book {
    int num_pages;
    double price;
    String name;
    String author;
     Book(){
          num_pages = 0;
          price = 0.0;
          name = "some_book";
          author = "some_author";
   }
 book ( num_pages, double price, String name,
  String author)
    {
     this.num_pages = num_pages;
     this.price = price;
     this.name = name;
     this.author = author;
  }
  ~~this~~ void set_data (int num_pages, double
 price, String name, String author)
 {
   this.num_pages = num_pages;
   this.price = price;
    this.name = name;
    this.author = author.
  }
   void get_data () {
   System.out.println ("Book details \n name:"
 + name + "\n author + "author+" \n number
 of pages : "+ num pages +"\n price : "+price);
```



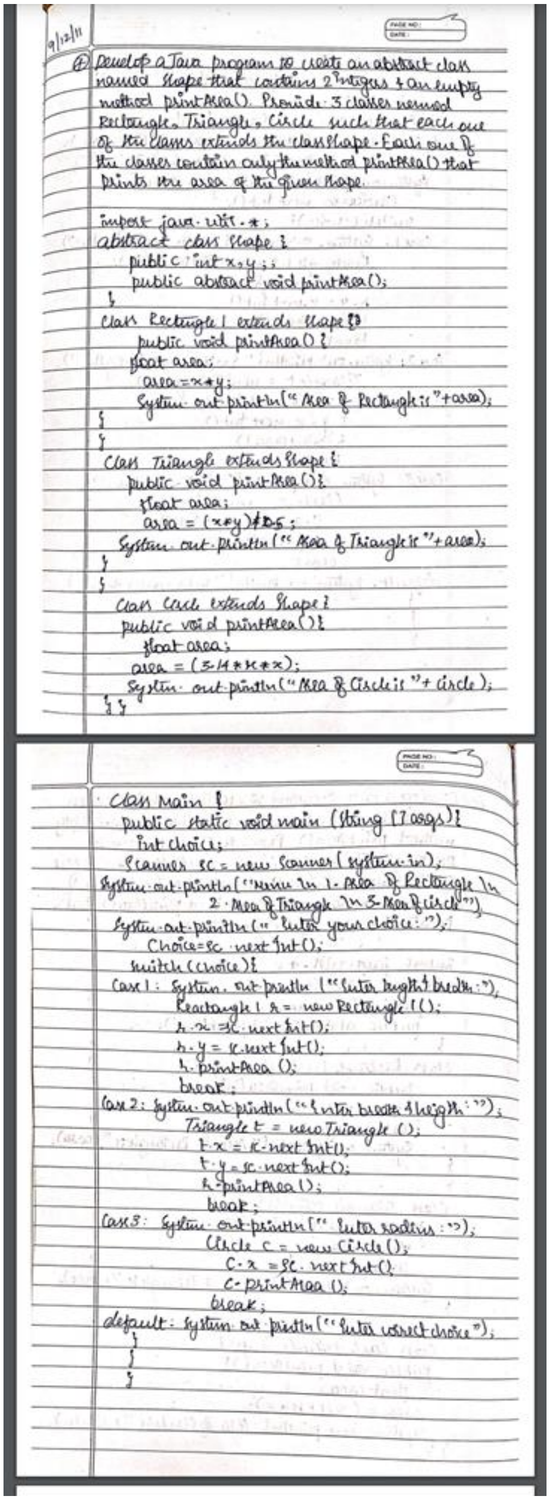
```
 System.out.println("\n - - - \n");
}
public String toString () {
return("Book details \n name : "+name+"
\n author: "+author+" \n number of pages:
" + num_pages + " \n price:"+price +
"\n - - - - \n");
}

 Class book1 {
 public static void main (String[] args) {
 book b1 = new Book();
 Scanner s = new Scanner (system.in);
 System.out.println("Enter the name of book:");
  String name = s.nextLine();
 System.out.println ("Enter the author's name:)
 String author = s.nextLine();
 System.out.println ("Enter the price :").
  double price = s. nextDouble ();
   System.out.println();
  b1.set_data (num_pages, price, name, author
 Book b2 = newBook(68, 87.55, "abc", "albert"
   b1.get_data ();
   b2.get_data();
   System.out.println(b1);
  System.out.println(b2);
   s.close ();
}
```

OUTPUT:



```
C:\Program Files\Java\jdk1.8.0_231\bin>javac Book.java

C:\Program Files\Java\jdk1.8.0_231\bin>java book1
enter the name of the book: abc
enter the author's name: ach
enter the number of pages in the book: 2
enter the price of the book: 350

Book details
name: abc
author: ach
number of pages: 2
price: 350.0
------------------------------

Book details
name: abc
author: albert
number of pages: 60
price: 87.55
------------------------------

Book details
name: abc
author: ach
number of pages: 2
price: 350.0
------------------------------

Book details
name: abc
author: albert
number of pages: 60
price: 87.55
------------------------------

C:\Program Files\Java\jdk1.8.0_231\bin>
```

4) 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.



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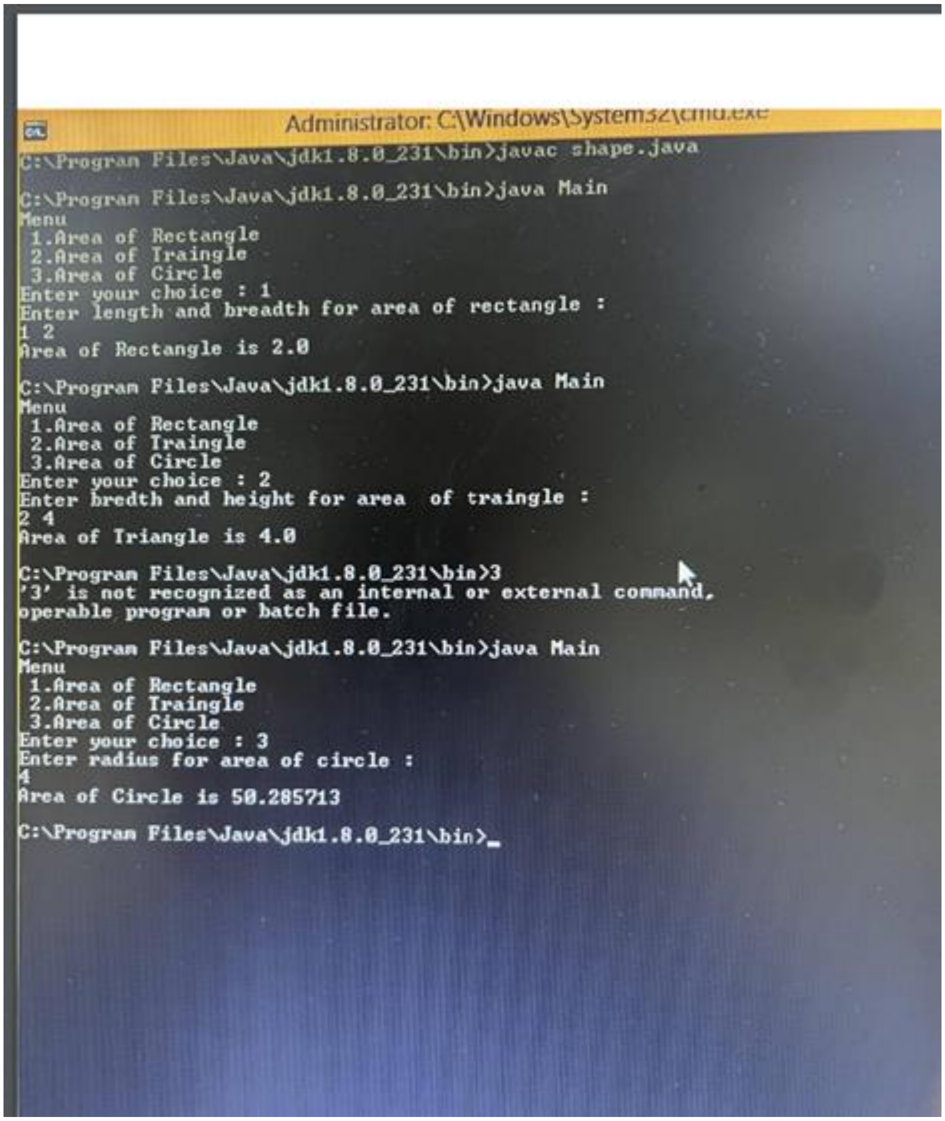
④ Develop a Java program to create an abstract class named Shape that contains 2 integers & an empty method printArea(). Provide 3 classes named Rectangle, Triangle, Circle such that each one of the classes extends the class Shape. Each one of the classes contain only the method printArea() that prints the area of the given shape.

```
import java.util.*;
abstract class Shape {
    public int x,y;;
    public abstract void printArea();
 }
class Rectangle1 extends Shape {
    public void printArea() {
    float area;
     area=x*y;
     System.out.println("Area of Rectangle is "+area);
 }
 }
 Class Triangle extends Shape {
   public void printArea() {
     float area;
     area = (x*y)*0.5;
   System.out.println("Area of Triangle is "+area);
 }
 }
  Class Circle extends Shape {
   public void printArea() {
     float area;
    area = (3.14*x*x);
    System.out.println("Area of Circle is "+ circle);
 }}
```

```
 class Main {
  public static void main (String [] args) {
   int choice;
   Scanner sc = new Scanner(system.in);
System.out.println("Menu \n 1. Area of Rectangle \n
             2. Area of Triangle \n 3. Area of circle");
 System.out.println(" Enter your choice: ");
      Choice=sc.nextInt();
   switch(choice) {
 Case 1: System.out.println ("Enter length & bredth: ");
           Reactangle1 r = new Rectangle1();
           r.x =sc.nextInt();
           r.y = sc.nextInt();
           r.printArea ();
           break;
Case 2: System.out.println("Enter breath & height: ");
           Triangle t = new Triangle ();
             t.x = sc.nextInt();
             t.y = sc.nextInt();
             r.printArea();
             break;
Case 3:  System.out.println(" Enter radius: ");
             Circle c = new Circle();
               c.x =sc.nextInt()
               c.printArea();
             break;
default: System.out.println("Enter correct choice");
   }
   }
   }
```

OUTPUT:



```
C:\Program Files\Java\jdk1.8.0_231\bin>javac shape.java

C:\Program Files\Java\jdk1.8.0_231\bin>java Main
Menu
 1.Area of Rectangle
 2.Area of Traingle
 3.Area of Circle
Enter your choice : 1
Enter length and breadth for area of rectangle :
1 2
Area of Rectangle is 2.0

C:\Program Files\Java\jdk1.8.0_231\bin>java Main
Menu
 1.Area of Rectangle
 2.Area of Traingle
 3.Area of Circle
Enter your choice : 2
Enter bredth and height for area  of traingle :
2 4
Area of Triangle is 4.0

C:\Program Files\Java\jdk1.8.0_231\bin>3
'3' is not recognized as an internal or external command,
operable program or batch file.

C:\Program Files\Java\jdk1.8.0_231\bin>java Main
Menu
 1.Area of Rectangle
 2.Area of Traingle
 3.Area of Circle
Enter your choice : 3
Enter radius for area of circle :
4
Area of Circle is 50.285713

C:\Program Files\Java\jdk1.8.0_231\bin>_
```

5) 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:

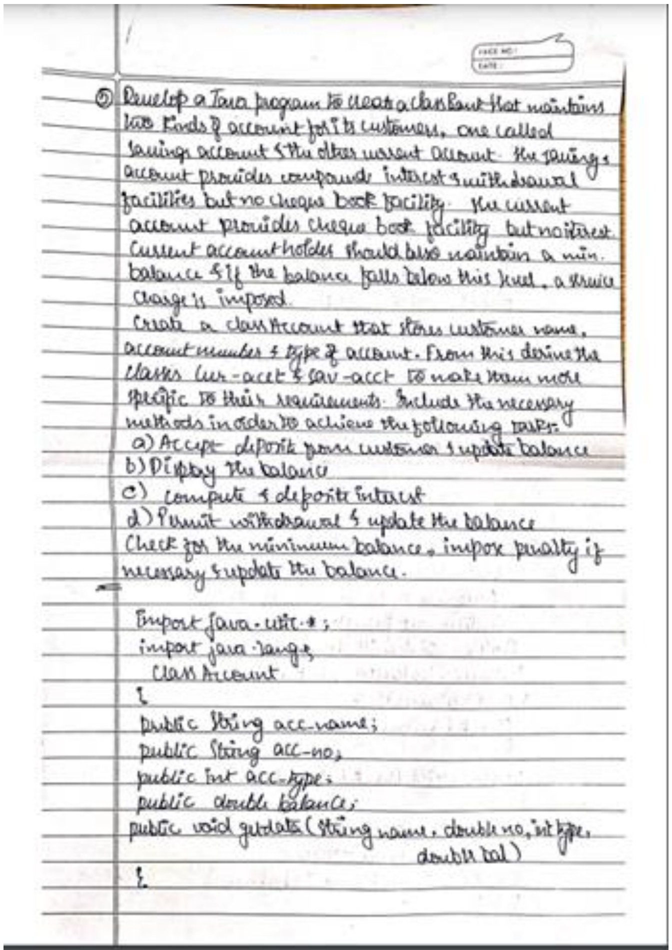
a) Accept deposit from customer and update the balance.

b) Display the balance.

c) Compute and deposit interest

d) Permit withdrawal and update the balance

Check for the minimum balance, impose penalty if necessary and update the balance.



⑤ Develop a Java program to creat a class Bank that maintains two kinds of account for its customers, one called saving account & the other current account. the savings account provides compound interest & withdrawal facilities but no cheque book facility. the current account provides cheque book facility but no interest. Current account holder should also maintain a min. balance & if the balance falls below this level, a service charge is imposed.

Create a class Account that stores customer name, account number & type of account. From this derive the classes cur-acct & 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 & update balance

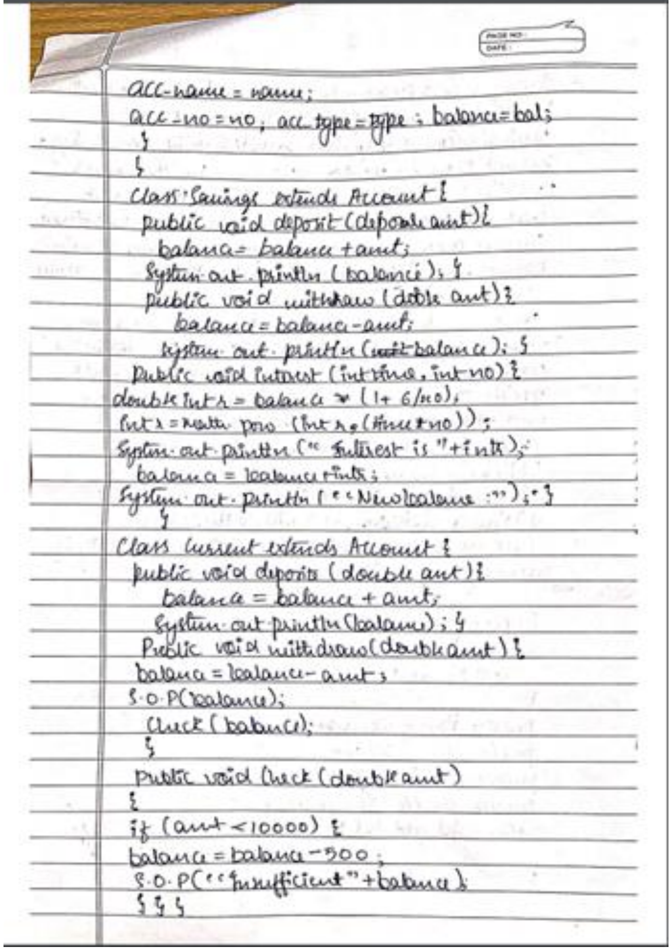
b) Display the balance

c) compute & deposit interest

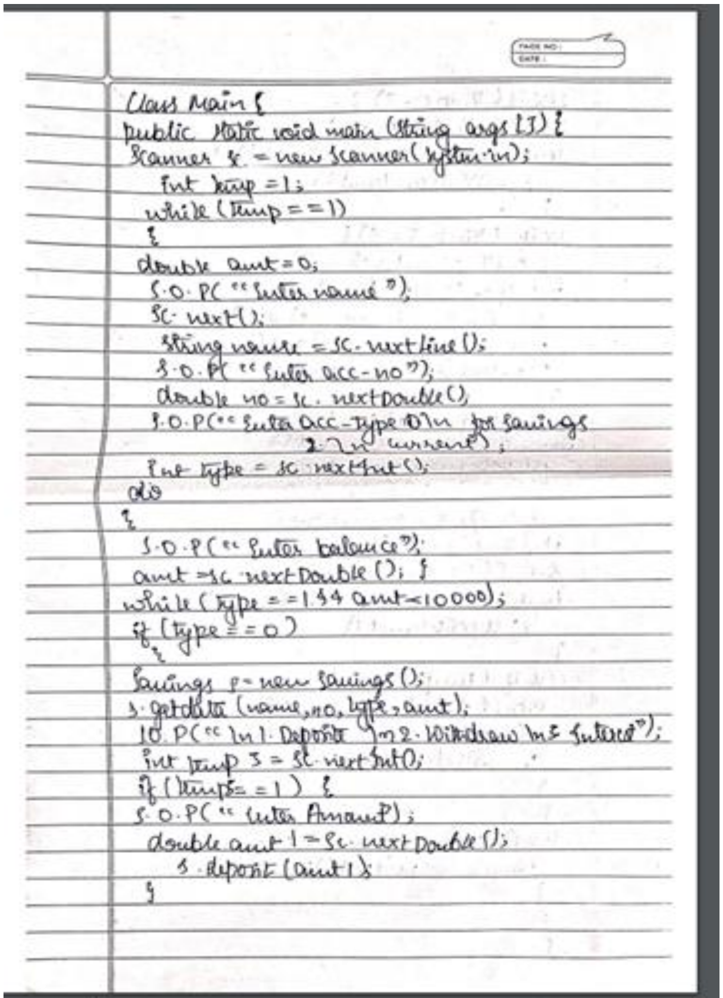
d) Permit withdrawal & update the balance

Check for the minimum balance, impose penalty if necessary & update the balance.

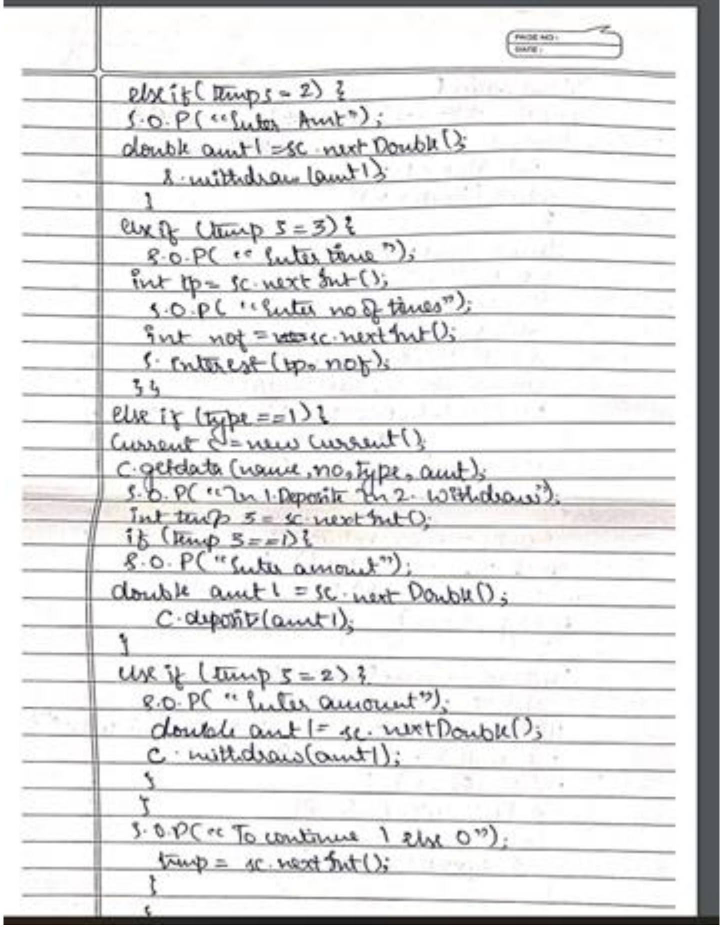
```
 Import java.util.*;
 import java.lang.*;
  Class Account
 {
 public String acc-name;
 public String acc-no;
 public int acc-type;
 public double balance;
public void getdata(String name, double no, int type,
                                  double bal)
 {
```



```
 acc-name = name;
 acc-no = no; acc type = type ; balance = bal;
  }
 }
 Class Savings extends Account {
  public void deposit (double amt){
   balance = balance + amt;
  System.out.println (balance); }
  public void withdraw (doble amt){
     balance = balance - amt;
   System.out.println (~~amt~~ balance); }
 Public void Interest (int time, int no) {
double Intr = balance * (1+ 6/no);
Int x = Math.pow (Int r, (time*no));
System.out.println (" Interest is "+ intr);
 balance = balance + intr;
System.out.println (" New balance :");}
   }
Class Current extends Account {
 public void deposit (double amt){
   balance = balance + amt;
  System.out.println(balance); }
  Public void withdraw(double amt) {
 balance = balance - amt;
 S.O.P(balance);
  Check (balance);
  }
 Public void Check (double amt)
 {
 if (amt <10000) {
 balance = balance -500 ;
 S.O.P(" Insufficient" + balance);
 }}}
```

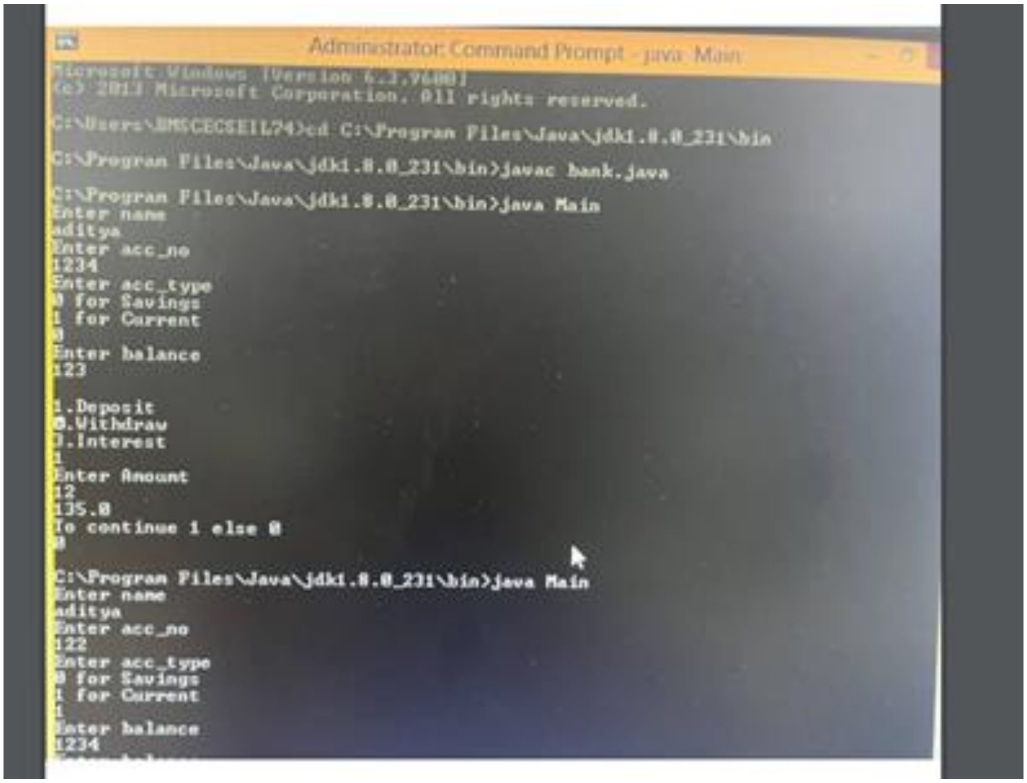


```
Class Main {
public static void main (String args [])  {
 Scanner sc = new Scanner(System.in);
   int temp =1;
  while (temp ==1)
  {
 double amt =0;
  S.O.P( "Enter name ");
  sc.next();
   String name = sc.nextline();
  S.O.P( "Enter acc-no ");
  double no = sc. nextDouble();
  S.O.P(" Enter acc-Type 0\n for Savings
                  1 \n current");
 int type = sc.nextInt();
do
{
 S.O.P( " Enter balance");
 amt =sc.nextDouble(); }
while ( type ==1 && amt<10000);
 if (type == 0)
  {
 Savings s= new Savings();
 s.getdata (name,no, type, amt);
 S.O.P( " \n 1. Deposit \n 2. Withdraw \n 3 Interest");
 int temp 5 = sc.nextInt();
 if (temp5 ==1)  {
 S.O.P( " Enter Amount");
  double amt 1 = sc. nextDouble();
    s. deposit (amt1);
  }
```



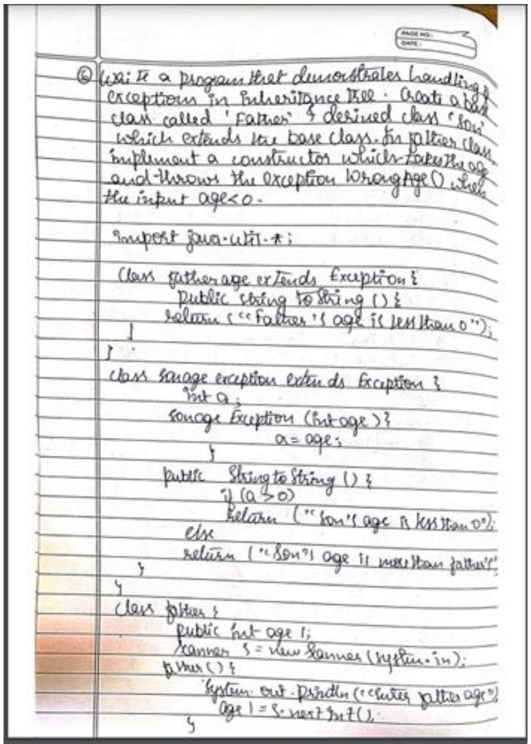
```
 else if ( temp5 = 2) {
 S.O.P( "Enter Amt");
 double amt1 =sc. next Double();
    s. withdraw (amt1);
  }
 else if (temp 5 = 3) {
  S.O.P( " Enter time ");
 int tp= sc.next Int();
  S.O.P( "Enter no of times");
  int not = sc.nextInt();
  s. interest (tp, nof);
 }}
else if (type ==1) {
Current c= new Current();
 c.getdata (name, no, type, amt);
 S.O.P( "\n 1.Deposite \n 2. Withdraw");
 Int temp 5= sc.nextInt();
 if (temp 5==1) {
 S.O.P( "Enter amount");
double amt 1 = sc. next Double();
   c.deposit(amt1);
}
else if (temp 5 = 2) {
  S.O.P( " Enter amount");
  double amt 1= sc. nextDouble();
  c. withdraw(amt1);
  }
  }
 S.O.P( " To continue 1 else 0");
   temp = sc. next Int();
  }
  }
```

OUTPUT:



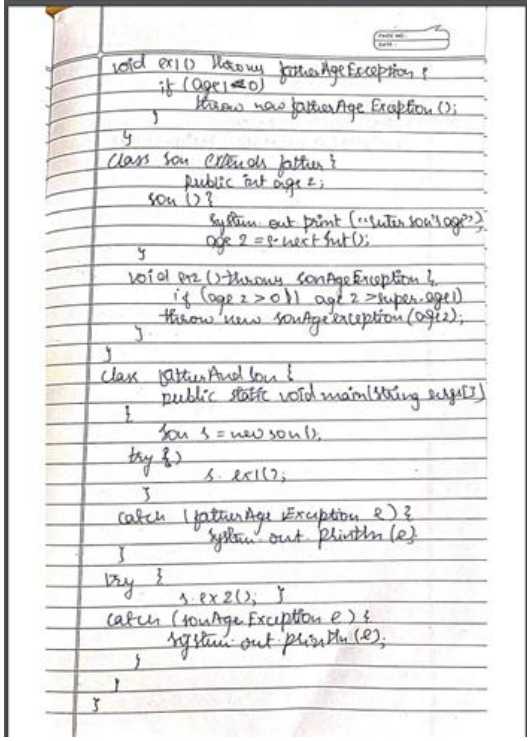
```
Microsoft Windows [Version 6.3.9600]
(c) 2013 Microsoft Corporation. All rights reserved.

C:\Users\BMSCECSEIL74>cd C:\Program Files\Java\jdk1.8.0_231\bin

C:\Program Files\Java\jdk1.8.0_231\bin>javac bank.java

C:\Program Files\Java\jdk1.8.0_231\bin>java Main
Enter name
aditya
Enter acc_no
1234
Enter acc_type
0 for Savings
1 for Current
0
Enter balance
123

1.Deposit
2.Withdraw
3.Interest
1
Enter Amount
12
135.0
To continue 1 else 0
0

C:\Program Files\Java\jdk1.8.0_231\bin>java Main
Enter name
aditya
Enter acc_no
122
Enter acc_type
0 for Savings
1 for Current
1
Enter balance
1234
```

7) 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.



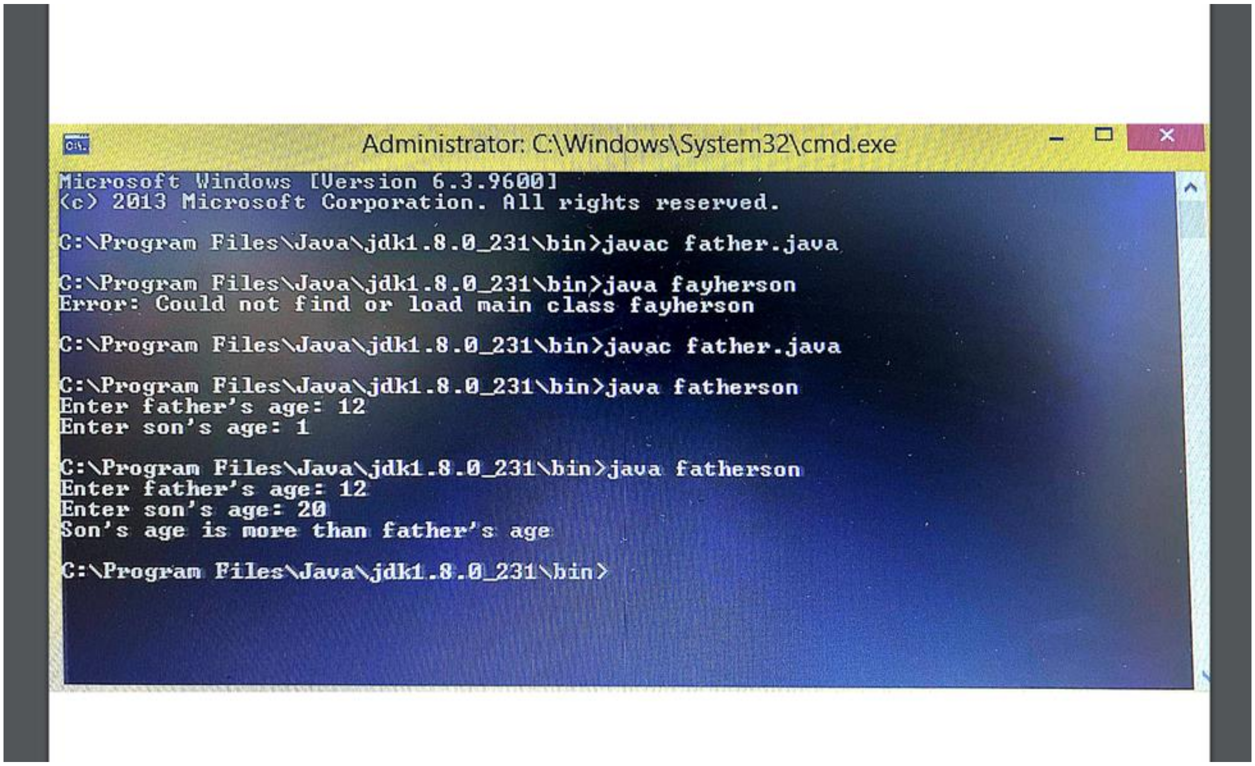
⑥ write a program that demonstrates handling of exceptions in Inheritance tree. Create a base class called 'Father' & derived class 'Son' which extends the base class. In father class implement a constructor which takes the age and throws the exception WrongAge() when the input age<0.

```
import java.util.*;

Class fatherage extends Exception {
        Public string toString () {
       return ("Father's age is less than 0");
   }
}
class sonage exception extends Exception {
        int a;
       sonage Exception (int age) {
                    a = age;
            }
       public  String to String () {
              if (a>0)
              Return ("Son's age is less than 0");
         else
         return ("Son's age is more than father's");
   }
}
class father {
       public int age 1;
       scanner s = new Scanner (system.in);
     father () {
           System.out.println ("enter father age");
            age 1 = S.next Int ();
        }
```



```
void ex1 () throws fatherAgeException {
     if (age1<=0)
          throw new fatherAge Exception ();
   }
}
class son extends father {
        public int age 2;
   son () {
            System. out print ("enter son's age");
            age 2 = s.next Int ();
   }
   void ex2 () throws sonAgeException {
        if (age 2 > 0 || age 2 >super.age1)
      throw new sonAge exception (age2);
   }
}
class fatherAnd Son {
      public static void main(String args[])
  {
      Son s = new son ();
   try {
             s. ex1();
     }
   catch (fatherAge Exception e) {
             System. out. println (e);
   }
try {
        s.ex2(); }
catch (sonAge Exception e) {
        System. out. println (e);
   }
 }
}
```

OUTPUT:



```
Microsoft Windows [Version 6.3.9600]
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C:\Program Files\Java\jdk1.8.0_231\bin>javac father.java

C:\Program Files\Java\jdk1.8.0_231\bin>java fayherson
Error: Could not find or load main class fayherson

C:\Program Files\Java\jdk1.8.0_231\bin>javac father.java

C:\Program Files\Java\jdk1.8.0_231\bin>java fatherson
Enter father's age: 12
Enter son's age: 1

C:\Program Files\Java\jdk1.8.0_231\bin>java fatherson
Enter father's age: 12
Enter son's age: 20
Son's age is more than father's age

C:\Program Files\Java\jdk1.8.0_231\bin>
```
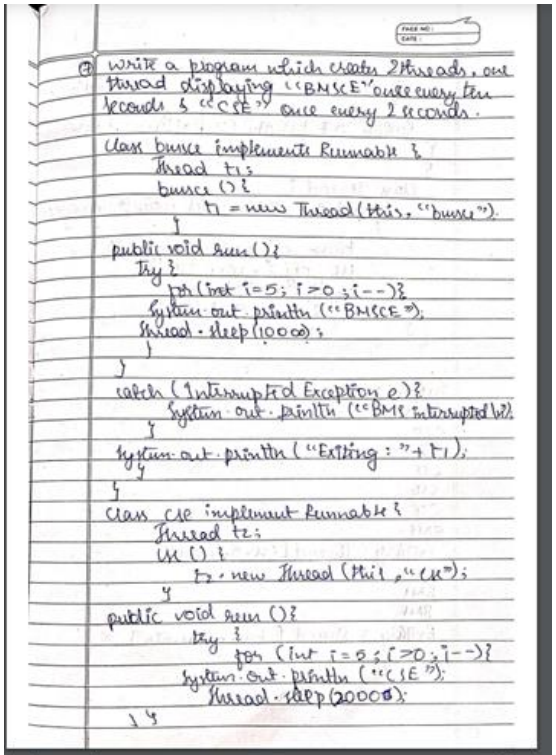
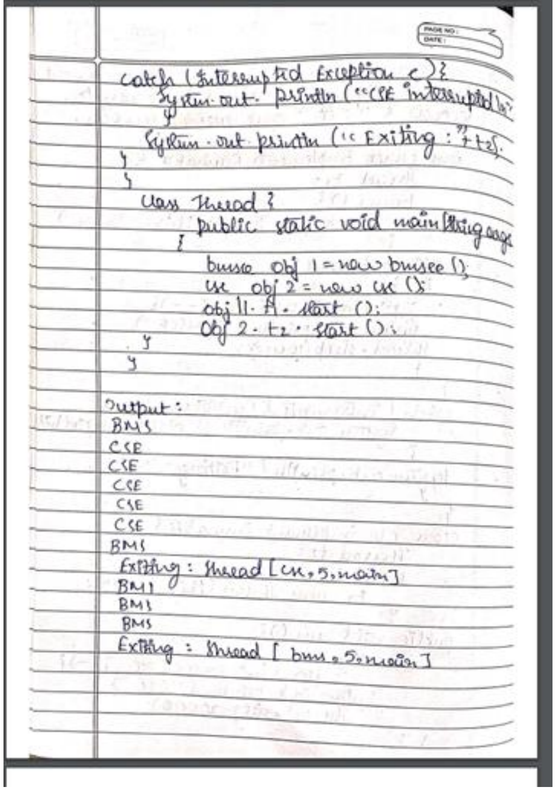

8) Write a program which creates two threads, one thread displaying “BMS College of Engineering” once every ten seconds and another displaying “CSE” once every two seconds.



⑦ write a program which creates 2threads, one thread displaying "BMSCE" once every ten seconds & "CSE" once every 2 seconds.

```
class bmsce implements Runnable {
      Thread t1;
      bmsce () {
            t1 = new Thread(this, "bmsce").
      }
public void run(){
   Try {
       for (int i=5; i>0 ;i--){
     System.out.println ("BMSCE");
   Thread.sleep(10000);
     }
  }
catch (InterruptedException e){
       System.out.println ("BMS interrupted")
     }
System.out.println ("Exiting : "+ t1);
   }
}
class cse implement Runnable{
      Thread t2;
      cse () {
          t2 = new Thread (this , "cse");
      }
public void run (){
          try {
               for (int i=5;i>0;i--){
        System.out.println ("CSE");
          Thread.sleep(20000);
   }}
```

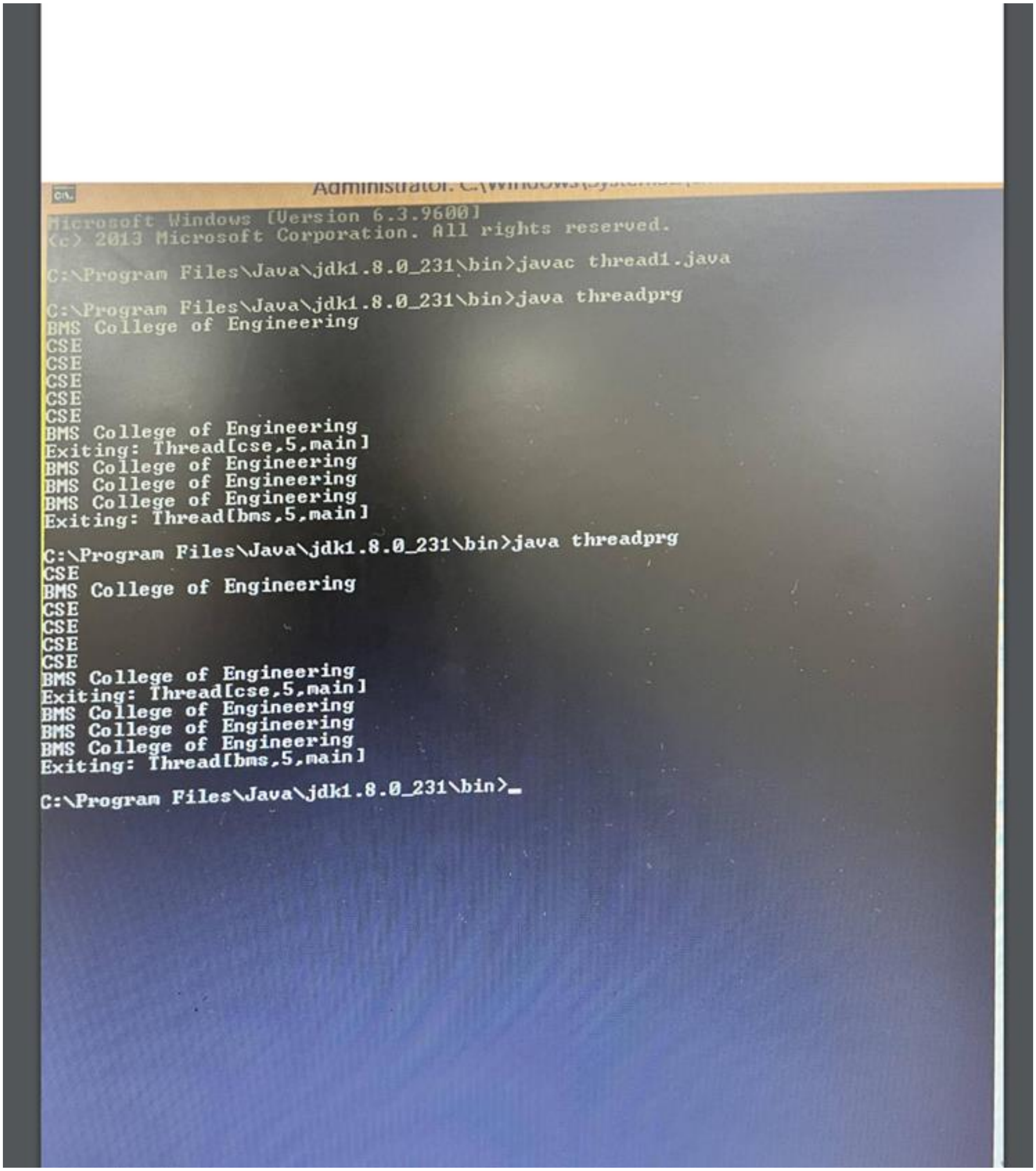


```
catch (InterruptedException e){
    System.out. println ("CSE interrupted");
   }
  System.out.println ("Exiting : "+t2);
}
}
  class Thread {
          public static void main(String args)
        {
          bmsce obj 1 = new bmsee ();
          cse obj 2 = new cse ();
          obj1.t1.start ();
          Obj 2.t2.start ();
   }
  }
```

Output:

```
BMS
CSE
CSE
CSE
CSE
CSE
BMS
Exiting : thread [cse, 5, main]
BMS
BMS
BMS
Exiting : thread [ bms, 5, main ]
```

OUTPUT:



```
Microsoft Windows [Version 6.3.9600]
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C:\Program Files\Java\jdk1.8.0_231\bin>javac thread1.java

C:\Program Files\Java\jdk1.8.0_231\bin>java threadprg
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
Exiting: Thread[cse,5,main]
BMS College of Engineering
BMS College of Engineering
BMS College of Engineering
Exiting: Thread[bms,5,main]

C:\Program Files\Java\jdk1.8.0_231\bin>java threadprg
CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
BMS College of Engineering
Exiting: Thread[cse,5,main]
BMS College of Engineering
BMS College of Engineering
BMS College of Engineering
Exiting: Thread[bms,5,main]

C:\Program Files\Java\jdk1.8.0_231\bin>_
```