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
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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 Pragramming (22CS3PCOOJ)" carried out by **Dhavan SK** (**1BM21CS054**), who is bonafide student of **B. M. S. College of Engineering.** It is in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum 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.

```
Quadratic Equation
import java, util. Scanner;
infort java. long math:
Public class Quadratic Equation {
public Static void main ( String args [ ]) {
 float a.b. c.d:
 double root 1, root 2:
 Scanna 8: new & Scanner (System.in).
System. out. print In (" Enter coefficients ");
 a = 8. nest float ():
  b = 8. next floor ():
d = (6+6-(4+a+c)):
  if (a = = 0) {
  System. out. print (" Not a quadrolic equation"):
  else : f (d>0) {
   root 1 = (-b + math. sqrt(d)) / (4+a+c):
 root & = (-b - math. &q + (d)) / (4 + a + c):
   System. out . print In ("Real and distinct roots as
                               : " + root 1 +" and " + root 2);
                   The confirm to the
 ehe :f (d <0) {
  root 8 = d/(x*a);
  System. out, print In (" Real and distinct roots are:
                          " + 9100 1+" and "+ root 2);
 else if (d<0) f
  roof 1 = -b/(R*a):
  root & = d/ (8 a);
 System. out. print In ("Imaginary roofs and distinct are" "+ roof + "+ i"+ roof & " and
```

```
" froot [ +" - i" + root 2) :
      3
     else : f (d = = 0) {
     root 1 = root 2 = -b / (R+a);
     System. out. println ("Real roots are: "+root 1+" and
   3
             g now & Scorner ( Sychem, (a)).
  3
 Output
i) Enter the co-efficient a. 1, -4, 6
 Imaginary 9001s and distinct are 8. 0+1-4.0 and
for our printle ( That a quadrate equation)
2) Enter the co-efficient 0, 5, 6
  Not a quadratic equation
3) Enter the co-efficient 1, 10, 5
  Real and distinct roots are: -0.062786404 and -0.94721359
4) Enter the co-efficient R. 4. R.
 Real mosts are: -1.0 and -1"
in the Contract and distinct went an
```

```
C:\Users\bmsce\Desktop>java QuadraticEquation
Enter coefficients:
3
5
5
Wot a quadratic equation
```

```
C:\Users\bmsce\Desktop>java QuadraticEquation
Enter coefficients:
1
-4
6
Imaginary roots and distinct are:2.0+1-4.0 and 2.0-1-4.0
```

```
C:\Users\bmsce\Desktop>java QuadraticEquation
Enter coefficients:
2
4
2
Real roots are:-1.0and-1.0
```

```
C:\Users\bmsce\Desktop>java QuadraticEquation
Enter coefficients:
1
-4
8
Imaginary roots and distinct are:2.0+i-8.0 and 2.0-i-8.0
```

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.

```
2 Develop a Java program to weak in class sheled wit
members USN name on array credits and studed were marks anclude method to accept and display black and a method to calculate SCAR of a student
import java, util. Scannas
doct student !
 illing name:
  String very :
 int marks [ ] . new int [ ] ?:
 int credit t I new ent to ] ?
 int tot evelite ()
    for (1:0: i =q; i++)
       t + t + evedit (:1;
    seture t ; & f
 class 01054 1
  public atatice void main (String args E7)
  & 8 OP ( - enter the student name use (m);
   int int:
   float 8 Gift - 0:
 Scanner Sc. new Examiner (System in):
Student 81 . New Student ();
 81. name : 80, next Line ();
 SI. URN = Sc. ment Line ():
 sor ( marks and credit of each subject are in)
 for ( = 0 : 1 < 9 : 1++ )
   SI. marks [ ] &c. next Ind ():
   if ( = 1 marks [:] = 100)
   81. marks [1] + (81. marks [1] ]/10);
```

```
81. marks [:] = (81. marks [:]/10)+1-
                SI. credit Ci] = 8 c. next Int(1;
                89 pa = 89 pa + 81, marks [i] + 81, credit [i]; }
                t = 81, total credits ();
                8gpa - Sgpa/(+);
                  8.0.P ("89 pa of" +81. name + " is \n" +89 pa); } }
    Output:
    Enter the student name, us n
          Rakshith 03R
   Marks and Credit of each Subject are
         98
                          10
         97
                               9
          98
                             10
         94
           93
         94
                                9 1 1 1 2 1 The state of the st
        91
   98
  98
                               10
SUPA of Rakswith OBR is 10.0
```

```
C:\Users\thris\OneDrive\Desktop\dhavan sk>cd C:\Users\thris\OneDrive\Desktop\dhavan sk
C:\Users\thris\OneDrive\Desktop\dhavan sk>javac student.java
C:\Users\thris\OneDrive\Desktop\dhavan sk>java cs054
Enter the student name,usn

Rakshith 032

Marks and credit of each subject are

98 10
97 9
98 10
94 10
93 9
94 10
97 9
98 10
97 9
98 10
97 9
98 10
97 9
98 10
97 9
98 10
97 9
98 10
97 9
98 10
97 9
98 10
97 9
98 10
98 10
98 10
98 10
98 10
98 10
```

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.

```
Scredie a class Book which contains four members: nave author force, num pages. Include a constructor to del
the values for the members. Include methods to see
 and get the details of the objects Include a to
 Astrong () wethor that could display the complete
debute of the book Develop a Java program to create in book object
import java ettil. Sconner;
public class book {
 String mame author;
 unt forice, nam- pages :
 book [] {
    this name : his
     this author = nall :
     the price : 0:
     this . num pages : 0 :
  Void infint () {
  Scanner & = new Scanner (System.in);
System out prix in ("Ender the name, outher, pro and number of pages of the book in the gree order:"):
   this name = 8- Kest (1:
   the cother = Emeste):
   thu, hoise : sinext [+t();
   this . num - payet = 8. nort [ +( );
 public String to String (1) 
naturn mane + " + author + " + price +
class beet 1 f
   public Static word main (String Darge) f
```

```
int size:
    Sconner 88 . new Scan-ex Cogatemin);
    System out faintly ("Ender the number of books: " ).
     edige: ss. ment Int ():
   book books - new book [ Sized ;
    for (1.0) in $130 : in) {
     books[i] - new book();
    Books [il. infaut ():
   System. out. println ( the details of the book
   for Cirot is Size ; itt)
      System. out. println (books [i]);
output .
Enter the number of books
Ender the name author force and number of pages of the booking on only
Shive presad
             Ta gree
                      80
later the name author fince and number of pages of the book - grows
                    80 100
Maris h
The delails of the book are:
                     80 100
Shivaparad Tagor
           Kalam 80 100
Marish
```

```
C:\Users\thris\OneDrive\Desktop\dhavan sk>cd C:\Users\thris\OneDrive\Desktop\dhavan sk
C:\Users\thris\OneDrive\Desktop\dhavan sk>javac book.java
C:\Users\thris\OneDrive\Desktop\dhavan sk>java book1
Enter the number of books:
2
Enter the name, author, price and number of pages of the book in the given order:
Shivaprasad Tagore 80 100
Enter the name, author, price and number of pages of the book in the given order:
Manish Kalam 80 100
The details of the book are:
Shivaprasad Tagore 80 100
Manish Kalam 80 100
```

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.

```
Java forgram to west an solution
        named whate that contain the integers or emply method name for al Area (). Preside
      classic named Rectangle, To any to and Circle
      the method from Aus () that fromto the
           the given whape
 import java will .
 abstract class a F
   double x y:
   a (double : double ; ) ?
    36-1-4-3
    abstract double one ():
class that extends a f
   Feel (double : double j) t
   double also () }
class to extende a f
   to Cable i double j') }
      Suber (i.i):
   double ofical) {
     letur 0.5 " x " y :
```

```
class in extends a f
     cir dri (double i double j) }
        Bufer (1, 1):
      double area () {
       return 055 x 5.14 x y:
   class week 4 f
      public static wid main (String args [1)
     Scanner 8c = new Scanner (System. in);
     System, out, Bowella (" Enter the length & breadth of rectang
     double 1 = 80. nestint ():
     double b : 80. next int ();
    System. out. Brist In ("End or the Sheight and base of triangle:)
     double h: 80. nextint ():
      double b : sc. next ind ():
   System out , for it In ("Enter the tradus of circle: "):
    double ra: 80 nestint ():
   hed h: new rect (l. b):
    drit: new fri (h.ba);
     cir c = new cir(xa):
System out, for all ( dres of rectangle is "+ r. area ());
System, out . for all ("Area of diargle is " + to area ());
System. out bintin ( Area of cicle is + c. area ()):
```

6. Output. Enter the length and breadth of rectangle: the sheight and base of Friangle: Enfor the tradius of circle: Area of rectancle is 20 drea of Iriangle is 18 dres of circle is 20096

```
Enter the length and breadth of rectangle:

3 4

Enter the height and base of triangle:

5 7

Enter the radius of circle:

6

Area of rectangle is 12.0

Area of triangle is 17.5

Area of circle is 113.03999999999999
```

- 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. Currentaccount 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 ofaccount. From this derive the classes Curacct 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 frogram to create a class Baix that maintains two Binds of account for all that customers. One called Lavings account and the other customers. One called sovings account from les comfons enterest account the withdrawal facilities about no chaque dook facility. The current account from des chaque dook facility. The current account from des chaque look faulty but no interest. Current account holy 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-act and Sav-ace t to make the more specific to their requirements. Include all the necessary methods in order to orcheve to following tasks a) Accept deposit from curtomer and repetate the balance o) Dusplay the balance. c) Compile and deposite enterest d) Permit withdrawal and update the balance check for the minimum balance, impose finally if necessary and explate the balance Complete the of import java. utl. # : import java. lang. math: class bank f Scanner 8c: new Scanner (System. in): String name: and acc-no; flood bal. Si?

```
voil accept ( ) &
  System. out. fr. ml la ("Enter your name"):
name = s c. nesct une ():
  System. out. frinkly (" Enter the balance amount".
 Void display () &
 System out foint In ("Name: "+ name):
Void deposit () }
 floor amount:
 int schoice:
 System. out. frint In ("Do you want to defort ( 'toryes
choice: 8c. next Ind ():
 if (choice == 1) {
 System out frint In ("Enter the amount to be defined
 amount = 8c, nextflood();
 if (amount > bal) f
 System out frinklin (" Amount in bank insufficient").
else &
bal : bal + amount;
System. out, frintly ("Current balance:
```

```
class current extends bank {
    2nd Service - fee : 50:
    Void cheque() }
   System. out. B. In ( Cheque Service available )
       withdrawal () {
  Void
  float and
  System. out, frontly 1" Enter the amount to be with
  amt = 8 c. next float ():
  if (and > bal)
   System out. frint In ("Balance insufficient
  else f
   bal = bal - ourl;
   if (bal < 1000) f
     bal = bal - Service - fee ;
     System out. frint In ("50" is taken as service for")
  System. out for Alm ("Withdrawn: "+amt);
  System. out, frint In ("Covered balance: "+ bal):
class Savings extends bank &
Bystem out, friedly ("Cheque skrvice not available");
Void cheque() {
```

```
Vod withdrawal () }
    Blood ant:
    System. out. for all ( Enter the amount to be withdrawn).
    ant = 80. next float ():
    if (and shal)
    System. out. for In ("Balance insufficient"):
    bal : bal and :
    System. out. formels ("Withdrawn: "+ and)"
    System. out. for at la (" Current balance: "+ bal):
  Void interest () {
   System out . frintly ("Enter the rate of interest"):
    dut n: 8c. nead Int ();
   System. out. find In (" Enter the time elapsed");
  unt + = 8c. merct Int():
   Si = bal + (i+ (a/n));
    Eystem. out. Sointin ( Compaind interest is "+ (Math. pow(si,
bubble class account of
  Suble State void nam (String args[]) &
   Scanner 8c = new Scanner (System. in):
   Sorving By 1 = new Savings ():
  content of & : new current ():
System out point In (" In I Savings account In R. Current account
  ; nt choice = Scone out Int ();
```

```
Switch Caholee ) 5
 cone 1: obj 1. accept ():
       Oly 1. Suplay ();
       dy + cheque();
      oly 1. deposit ():
       Oly: 1. interest ():
       Oly: 1 withdrawal ():
       break ? moderne ) + 2 mg
 case 2: obj 2. ought ();
    Oly R. display ();
  Oly 2. cheque():
    Olj 2. defosit ()
    ely 2. withdrawal();
break
default: System. out. fr. int In ("Invalid choice")
Extract finally ( Confound justiced is + (math profit
```

```
1.Savings account
2.Current account
Enter your name
Dhavan SK
Enter the balance amount
10000
Name : Dhavan SK
Cheque service not available
Do you want to deposit(1 for yes ,2 for no)
Enter the amount to be deposited
5000
Current balance : 15000.0
Enter the rate of interest
Enter the number of times interest applied per time period
Enter the time elapsed
Compound interest is 3.4050628916015623E46
Enter the amount to be withdrawn
4000
Withdrawn : 4000.0
Current balance : 11000.0
```

7) Write a program that demonstrates handling of exceptions in inheritance tree. Create abase class called "Father" and derived class called "Son" which extends the base class. InFather 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 bothfather and son's age and throws an exception if son's age is >=father's age.

8 Write a freguen that demonstrates handling of exceptions in infrarelance three. Create father and derived class called for which extens The lase class. In father class implement a constructuelar which takes the age and throw the exception wrong Age () when the In Son class, emplement so constructor that were both father and don't age and throws an works if does age is > fathers age import java. wil. +: class Wrong Age Exception collecte Except on String mag, new String (): Wrong Age Except on / Stong a) { mig = x; - | x = x = mig _ land Auble String to String 1) saturn mag and f. age; father () throws wrong Age Exceptions Evanner S: new Scanner (System. in): ayetem. out frint In (Enter father's age: "): f age . S. nead Int (); if (f. age ~0) } throw new Wangthe Exception ("forther age < 0")

```
Void display () {
  System out frially ("father age: +f-age):
class Son extends father &
int 8 age:
Soul) throws Warng Age Exception {
  Scanner 8: new Scanner (System. in);
 System. out. frith ( Enter bond age: "):
   8. age = 8. next Ind ();
  if (8-age < 0) }
   throw new Warng Age Exception ("Son age <0");
   else if (8-age > f-age)
    throw new Wrong Age Exception ("Son age is >
                                      that father's age!");
                     I spe with tothe
                             fades Baltes age & 68
Void display ()
                             Es you was a B
 System. out. frintln ("forther age: "+f-age);
 Bystem. out . println (" Son age : "+8-age);
closes excep &
spublic Static void main (String [] args) &
1.y
```

father for new father (): f. defloy (): Sons . new Son(): S. display (); (atch (wrong fig c Exaption was) System. out. p. intln (was);; 3 Output Enter father is age: 45 Enter Son's age: 67 Son age > that father's age Esta Pather age & 84 Ender sons age a 19 Enter father's age: 45 Enter Son's age: 47 Some age cannot be greater than fathers age!

```
Command Prompt

- C ×

Father age: 54
Enter father's age:

54
Enter son's age:

65 Son age is > that father's age!

C:\Users\STUDENT\Desktop\1BM21CSØ54>java excep
Enter father's age:

54 Father age: 54
Enter son's age:

61 C:\Users\STUDENT\Desktop\1BM21CSØ54>java excep
Enter father's age:

54 Father age: 54
Father age: 54
Father age: 54
Father age: 54
Colored age:

63 Son age is > that father's age!

64 Son age is > that father's age!

65 Son age is > that father's age!

65 Son age is > that father's age!

65 Son age is > that father's age!

66 Son age is > that father's age!

67 Son age is > that father's age!

68 Son age is > that father's age!

69 Son age is > that father's age!

60 Son age is > that father's age!

61 Son age is > that father's age!

62 Son age is > that father's age!

63 Son age is > that father's age!

64 Son age is > that father's age!

65 Son age is > that father's age!

66 Son age is > that father's age!

67 Son age is > that father's age!

68 Son age is > that father's age!

69 Son age is > that father's age!

60 Son age is > that father's age!

61 Son age is > that father's age!

62 Son age is > that father's age!

63 Son age is > that father's age!

64 Son age is > that father's age!

65 Son age is > that father's age!

66 Son age is > that father's age!

67 Son age is > that father's age!

68 Son age is > that father's age!

68 Son age is > that father's age!

69 Son age is > that father's age!

60 Son age is > that father's age!

61 Son age is > that father's age!

62 Son age is > that father's age!

63 Son age is > that father's age!

64 Son age is > that f
```

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.

```
9 weste a Grogiam which executes few threads one threads
displaying BMS callege of Engineering once every ten decords and another displaying coe once comy due seconds
 class bus imprements Rennable &
       bms () 5
            to men thread ( this bors ):
       Bublic void Aun () }
        try {
           for (ind is 5 · 1>0 : i-) {
System. not. familla ( OMS college of Engineering );
Thread. Sleep (10000);
       Cotch ( Interrupted Exception e) }
        System out formal ("BMS interrupted ("):
       System out frintle (" Exiting : " ++1):
4
class use implements Runnable &
        Thread + R:
             the new Thread ( the , "cae"):
       fullic void sun () }
               for (: s; 1 >0 ; : --) {
```

```
System out frith (-C85-):
                Thread. Sleep [2000];
         Cotch ( Interrupted Eaception e) {
             System out for utla ("CSE interrupted \");
           System out for int (" Boiling: " ++ e);
       3
      class threadprog 1
             public static void main (String args []) !
               brus obj 1 - new brus (1)
               cse obje: new esel);
                0 bj 1. +1. Start ();
                Obj R. + R. Start ();
    8.
   output :
          College of Engineering
   £8 €
    CSE
   CSE
   CSE
   CSE
 BMS tollege of Engineering
Exiting: Thread Lose, 5, main
BMS College of Engineering
BMS College of Engineering
BMS College of Engineering
Exiting . Thread [ bms 5, main
```

```
C:\Users\BMSCECSEIL74\Desktop\1BM21CS054>java threadpry
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
Exiting: Thread[cse,5,main]
BMS College of Engineering
Exiting: Thread[bms,5,main]
C:\Users\BMSCECSEIL74\Desktop\1BM21CS054>
```