

B. M. S. COLLEGE OF ENGINEERING

(AUTONOMOUS COLLEGE UNDER VTU, BELGAUM) BANGALORE – 560019

2022-23

LAB RECORD

OBJECT ORIENTED JAVA PROGRAMMING (23CS3PCOOJ)

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SECTION: E

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LAB PROGRAM 12/12/23 RA-12-12-23

Develop a java program that prints all real solutions to the quadratic equations axe that I the quadratic formula . If the discommate be-40cl is negative, display a message stating that there are no real solutions.

```
import jara util Scanner;
 class Quadratic
    inta, b, c;
    double 11,12,0;
     void get d()
      Scanner 5 = new Scanner (system in );
      System out print ("Enter the coefficients of a, b, i);
       a= 5. neat lut ();
       b= s.next let ();
       (= s. netlit ();
   void compute ()
      while (a==0)
           System. out. println ("Not a quadratic equation");
           System.out.print la ("Enter a non zero value fora");
            Scanner 5 = new Scanner (System.In);
            0=5. next (1);
         d=b*b-4*a*c;
         if cd == 0)
```

```
r=(-b)/(2+a);
   System. out , pront (n ("foots are real and equal"):
   System .out - print ln (1 Root 1 = Root 2 = "+r1);
   else if (d>0)
       [1= ((-b)+ (Moth sqrt (d))) / (double) (2 Pa);
       12 = ((b) - (Math. sqrt (d))) / (double) (2*a);
       System. out privat in ("Roots are Real and distind");
       System . out. println ("Root = "+1+1+1"Root 2="+12)
    else if (d 20)
          System. out print In ("Roots are Imaginary");
             r1 = 1-6)/12 Ra);
            12 = Moth sqrt (-d) /2+a);
            System, out print ln ("Root 1"="+1+1"+i"+12),
            System, out . print In ("post |= "+1+"-i"+12);
class Quadratic Main
     public static void main (string args [])
```

androtic q = new androtic();

```
goods a gold ()
                System. Out println ("Schon AR - 18mnes 185");
  Eight
1) later the organizeds of a, b, c
                                 Rot 1 = Q Q xxx Root 2 = - 1
     Knots are real and equal 50 han AR - 1BM22C5285
1) fater the coefficients of a,b,c
                                  Root 1 = -0.2679491924311228
                                  Nost 2 = -3.732050 80788877
     Roots are Real and distinct
     Sohan AR-4BM2765285
3) Enter the coefficients of a, b, L
       Roots are imaginary
       Root 1 = 0.0 + 60.484 1229 182 75 927 1
       Roof 1 = 0.0 -10.4841279182759271
       Sohon AP - IBM 27 CS285
```

```
LAB Program 2 A29-12-23
a Develop a java program to create a class students with members usn
    I name and array credits and array marks. Include methods to
    accept and display details and a method to colculate 36,PA of a
     student
       import java . util . Sconner;
         class subject &
             int subject Marks;
            int credits;
            double grade;
         class student &
             String name;
              String usn;
               double SGPA;
               Sconner 5 j
                Subject [] subjects;
           student () &
                 Subjects = new subject [9];
                 for (i=0 ; i=9; ift)
                        subjects [i] = new Subject ();
                   5 = new Scanner Csystem . n ) >
               void get Student Petails ( ) &
                    System . out . print ln ("Exter the student name");
nume = s. p. next une ();
```

```
System. out - point In (" Enter USN");
  vs n = s.next line ();
void getmarks () {
    for Chiti=0; i<8; i++){
       System . Out . println ("Enter marks for subject + (1+1) + ":");
        Subjects [i] · subject Marks = S. next Int ();
        System. out. print In ("Enter credits for subject"+(i+1)+":");
        Subjects [i] . credits = s next Int ();
         Debjects (D) coldings
         Subjects [i] grade = subjects [i] . Subject Marks/10.0 +1.0; if (Subjects[i] grade = 11)
Subjects[i] . grade = 10;
  Void compute SGPA () {
       double total credits = 0;
       double weighted Sum = 0;
      for list i=0; i=8; itt ) q
              total Credits + = subjects [i] . credits;
              weighted Sumt = subjects [i] credits * subjects [i]-grade;
         SGPA = weighted Sum / total Credits;
   void display Result () 4
          System.out. print la ("Student Name: " + name);
          System. Out. println ("USN: "fusn);
         System . out . print In ["ShPA: " + ShPA");
```

```
public class main &
       public static void main ( string[] args) &
            Student s1 = new student ();
             Sl get Student Details ();
              51 get Marks ();
              SI. compute SGPAL);
             Sl. drsplay Result ();
Output.
Enter Student Name:
  Sohan
                                    J. J. Harris
 Enter USN:
                          Of Bloom of Returned
 18M7715285
 Enter marks for Subject 1 '.
                                     1192314
    90
  Externaciones for subject 1.
                                    Has lot of the
  Exter marks for Subject 2:
                                   11/1/201
  Enter credits for Subject 2:
                                     1 30 1100
   Exter marks for Subject 3:
    Enter credits for Subject 3:
    Enter marks for Subject 4:
     Enter credits for Subject 4:
```

Enter morks for Subject 5: Ender credits for subject 5. Enter marks for Subject 6: Enter credits for Subject 6: Enter marks for Subject 7: Enter credits for Subject 7 Enter marks for Subject 8 Enter credits for Subject 8 . Student Name: schan USN. IBM7715785 56 PA: 9.8454 54545456 MAZ6-12-23

Q Create class Book which contains journambers: name, author, price, num-pages. Include a constructor to set the values for the mombers. Include methods to set and get the details of the objects. Include a to string () method that could display the complete details of the book. Develop a Javap program to create a book objects.

import java - util. Scanner ;

Class Books &

String name, author; int price, num pages;

Books (String name, String author, int price, int num loges) {

hat of the sta

this name = name;

this · author = author ;

this . price = price;

this -numbages = numbages;

90

public String to String () &

String name , author, price, rumlages; name = "Book names:"+this name + In");

outhor = "Author name: "+ this author + " \n";

price = "Price: "+ this. price + "\n";

numPages = " Number of pages: "+this numlages + " \n";

seturn name + author + price + numbages;

.6

20

```
class BrokMain &
     public static void main (String[] args) {
       Scanner Se = new Scanner (System. In);
        int n;
        String name, author;
        int price, numbages;
        System out print In ( " Fater the number of books: ");
         n = sc . nent Int ();
         Books D[] = new Books[n];
        for (Inti=0; ien; ite) $
               System. out. println ("Fater Nome, author, price and number of pages")
                nome = sc. nent ();
                author= Sc. next ();
                 price = sc. next Int();
                 b[i] = new Books (name, author, price, numbages);
           System .out . printin ("Book Details:");
            for lit 1=0; iEn; ite ) &
                    System . Out . print In ( bCi ) . to String ()):
Dutput:
       Sohan AR
Name:
       15M1765785
 Exter the number of books:
  Enter Name, author, price and number of pages:
     1000
```

100

Enter Name rauthor, price and Number of pages:

Sava for beginners

Harry
3999
499

Enter Name, author, price and number of pages.

Advanced Java

Kevin
2999
799

Book Details .

Book name s: 005

Author name: Alos

Price: 1000

Number of Pages = 100

Book name 5: Java for Beginners

Author name : Harry

Prices : 3999

Number of pages: 499

Book name s: Advanced Javan

Author name : Kevin

Porce: 2999

Number of pages: 799

LAT PROGRAM 4 7-1-24 PRA 2-1-24 * Develop a Java Program to erecte on abstract class name shape that contains two integers and an empty method named printereal for provide three classes name - of Rectangle, Triangle and Circle such that each one of the classes enten--d's the class shape - Each one of the classes contains only the method print Area () that prints the area of the given shape import java. util. Scanner: class Input Scanner & Scanners; Input Scanner () { S = new Scanner (System.in); abstract class shape extends InputScanner & doublea; double bi double r; abstract void get Input (); abstract void Display Area (); Class Rectangle entends shape & void getInput(){ System-out print la ("Enter the sides of the rectangle"): a = g. next Double (); b = 5-next Double (); System out. println(" The area of the rectangle 15" + a " 10+ " "); word Display Areal) q

```
class triangle extends Shape &
   vold gd Input () &
       System. out. print In C"Enter the sides of the friangle");
         Q = 5. next Double ();
          b = 5. next Double ();
    rold Display Areal) f
            System out print In (" the ower of the triangle 15" + (0.5 % a &b)+")
     class fincle extends shape a
             void getInput () {
                   System. out-println ("fater the radius of the circle");
                   r = s-next Druble ();
         word Display Areal) &
                System. Out. println [ "Theorem of the orders" + 3.14 % + 7 + " (");
            Shape mains
             public static void main (String args []) &
              Rectargle r = new Rectargle ().
               Trianglet = new Triangle();
               Circle L = new (wile ();
                   r. get Input ();
                   1. Display Areal);
                   t. get Input ();
                    t. Display Area();
                    () they I top . )
                    1. Display Areal }
```

System . Old - print (n ("Solvan A P - 18M7115785") =

Inter the sides of the rectorgle 15 4.0

Shor the sides of the triangle is 6.0

Fater the radius of the circle is 50.24

Shor A R - IBM2265285

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

o) Accept the deposit from customer and update the balance

b) Display the bolonce

·) compute and deposit interest

d) permit withdrawal and update the bolance

* check for the minimum balance, impose penalty of necessary are update the balance

Code:

inport java - util . Scenn er;

class account

String name;

int acc no;

String type;

double balance;

account (string name, intace no, String type, duble belone)

```
this name - have;
this accus - accus;
this type - type;
this - balance = balance;
void deposit (double amount)
   bolance += amount;
 void withdraw (druble amount)
     if CC & balance - amount) >=0)
       bolance-=amount;
      system. out. print n ["Insufficient balance, cout withdraw");
  Void display ()
   System. out-println ("name:"+ name + "accno:" + accno + "type: +type
      + "balance" ") + balance);
     class sav Acet entends account
         private state double rate = 5;
          Sav Acit (String name, int accus , double belonce).
```

```
super (name, accus, 'savings", balance);
  void interest ()
       boland + - bolonce (rode ) 1100;
       System. ord. println ("balance."+ balance).
        class wract extends account
            private double minBal = 500.
            private double service thouges = 50;
            current (String name, int acces, double balance)
               Super Chave, all no, "Lurrent", bal ane);
           void checkmin ()
              if (balance <mmBal)
                 System. out. printle ("balance is less than min balance, serveth
                    Charges Imposed: "+ Service Charge & );
                   Bystem. out. printin ("balance is: " + balance );
              aclass account Main
```

```
public state c void main (String a [7)
  Scanner S= new Scanner (System.In);
  System-ord println ( "Enter the name :");
   String name - s next ():
   System out println ("Enter the type (correct [savings):").
    String type = s neat ();
    System - out . print in C. Rester the account number : "):
    Int occors - next Int ();
    System out printle Créater the initial balance: "):
     double balance -s-next Double ().
      mt ch;
      double amount 1, amount 2;
       account acc = new account ( name raicho, type, balance)
       Sav Alle sa = new savAcct (name, accno, bolance);
       cur Acit ta = new cur Acit (name, acino, balance);
       while (true)
         if call-type-equals ("savings"))
             System. out println ("In Menuln 1. deposit 2. with draw 3- compute inderest
                                      4- display ");
              3 ystem out printle C"Enter the choice");
               Ch = s. next Int ();
                Switch (ch)
                 case 1. System. out. print In ("Exter the amount."):
                  amount = s. nest Int ();
                  Sa-deposit (amount 1);
                  break ;
```

```
Case?: System and product of the amount ");
 anvent ? - 5 med Id ();
   sa withdraw ( amount 2);
    break ;
   lase 3: sa. intended;
    break;
    Case 4: 5a display ();
     break;
     Case 5: System. eart (0);
     default: System.out. println ("mealed input");
     break ,
      else
     System. out. printly (" \n Menula l'deposit 2. withdraw 3. display");
      Sychon out printly (1 Enter the chill");
          Ch = s.next[d();
         switch (ch )
            Case 1: System. out printly ("Enter the assort:");
            amount 1 = 5 nead Int ();
             Ca. deposit famount 1),
             break;
             case ? = System. out. print la l'élater the amount : ");
              amount 2= s. nostint ();
                Os Ca-withdrow (amount 2);
                   ca . Check min ();
                     break;
```

```
Case 3: ca-desplay (1:
  break;
   Cose 4: System. east (0)
   deput : System . and . printly ("invalid impat");
  or system out printin ( "Sphan A.R - 1BM27C5285");
Output: Sohan AR - 1BM72CS285
 Ester the name: Sohan
 Enter the type (current/savings):
  Correct
 Enter the account number:
 1217776
 Enter the initial balance:
  10000
 Menu
 1. diposit 2. with draw 3 display
 enter the charce.
  name: sihan accino: 1219776 type: current balance: 9800.0 menu
   1. deposit 7. withdraw 3. desplay
   enter the choice:
```

Enter the name: Shan Enter the type (current/soungs): savings Exter the account number: 177777 Enter the initial balance: 7800 Meny 1 deposit 2 mithdraw 3. compate interest 4-display Exter the choice Ester the amond: 6000 Menu 1. deposit 7. withdraw 3. compute interest 4. display Enter the charce: balance: 1890 Mela 1 - deposit 2 withdraw 3 - compute interest 4. display enter the charge: name: sohon aceno: 122222 type. savings balance: 1890. O

1 3 11 24

```
LAB- 6
1) Personstrate String leight , String literal string Garlet;
       Public class Maring
         public atatic void rain (string @CJargs). &
           11 Stong leight demoistration
            string stil = "Helle world";
            and leight = strl length();
            Sydem.ad. printly ["strug:"+strl);
            System. at. println ("length of the string: " + length);
             string strz="Java";
             String str 3 = "Java";
               bulean are occaval = (str 2 = = str 3);
               System. out. printle (" Are 5tr 2 and str 3 equal? " + are Equal)
              String first name = "Tohn " 2)
                String last name = "Doe";
                String full name = first name +" "+ last name
                System . out . printin (" full name : " + full name )
            3 System out proten ("Sohan AR -18M9715785 ")=
      015: Sohan AR -1BM27C5285
             String : Hello world &
              length of the string: 13
               Are str2 ad str3 equal true
```

Full rave: John Don

217) write a Java program to payorm sorting of numbers from 10 to 1 using compar. Auport java it it - Arrays, public class Number Botting & Papable state void main (strag [] args) & Integer () numbers = new Integer (79/10/9,8,2,6,5,4,5,7,17) Array Sort (numbers); System. out. prot la ("sorted Numbers l'Ascending order): "): for litteger number: numbers) & System. out. printly (number + ""); System. ord. protents; Array sort (nowbers, co, b) -> b. compare to (a)): System. at. printly 1" Sorted his in descending order : "); for [Tubeger number : number) { System and print In Invintor + ">> System. Out. print | n ("Sohan AR - 1B mzzes 235") Output: Sohon AR-IEM2215785 Sorted Numbers (Asserding order): 12345678910

Sorted nos in descending order:

pro) write a java program to create an abstract class shape with abstract methods calculate Area () and Calculate Perimeter (). Create subclasses CHILE and tring Tringle that enland the shape class and implement the despective methods to calculate the area and princter quach slape injort java will Scanner; abstract class shape & abstract double extendate Areal); abstract double calculate Permeder(); Class Errele extends Shapeof private drable radius; Public Enclet double radius) & this radius=radius, (O Drurfide double calculate Area () & return Math. P7 & Math-pow (radius, 6:2)-(D venide double calculate Perimeter () & Potern 2k Moth . PI " radius ;

class Triangle extends Shapiq
private double side 1, side 7, side 3;
public Triangle (double side 1, double side 2, double side 3) {

```
this sidel = statel;
 this - side 2 = side 2;
   this - side 3 = side 3 ;
@ Override
  double colonte Area () {
     double 5 = ( sidel eside 2 + side 3) /7 ;
       Peturn Math squt Ls# Cs-sidel ) * (s-sidez) *(s-side 3).)
  (a) greent de
     double calculate ferimeter () &
           return side 1 + Side Zest de 3 :
   public class his
       public static void movin (string () args) &
              Sconner scanner = new Scanner (System-In)
         System. out. printly [" later the radius of the arcle.")
           double circle Radius = scanner. neut Double 1);
            (Incle and = new Eircle 1 ande Roughs):
          System. out. protly (Fiter the length of side ) of the triang!");
             dauble triongle Sidel = scanner next Double ();
             System. Aut. print la Confester the longth of stole 2 of the trung
              double tragle side 3 = source . next Double ();
```

system out printly C "Enter the length of Side 3 of the friend ! -) =

don't triangle Side 3 = scanner next Double ():

Triangle triangle = new Triangle (Inlangle side 1 , triangle Side 7 , triangle side 3)

Scanner. close () =

system out print in (" In Circle Area: "+ circle (alculate Area(s))

System out print in (" (trible Perimeter: "+ circle (alculate friender ());

system out print in (" (in Triangle Area: "+ triangle (calculate tree());

System out print in (4 rangle ferimeter: "+ triangle (ulade ferimeter ());

g system out print in (4 rangle ferimeter: "+ triangle (ulade ferimeter ());

g system out print in (4 season Are - 18 marcs 285 ");

aitput: Sohan AR - 18M2218285

Cotor the radius of Circle: 2

Cotor the largeth of side of the triangle: 3

Cotor the length of side of the triangle: 3

Exter the length of side of the triangle: 3

Exter the length of side of the triangle: 2

Lincle Area: 12.561

Circle formater: 12.561

Triangle Area: 12.563

a write a Java pregrave to create a generic does stack which holds 5 integ and 5 double onlives. Class Generic Stock<774 private Object () Stock Array ; private sit top = -1; private static final int MAX-5176=5; public Generic Stuck () { stackArray = new Object CMAX-5176]; public void push (T value) & if Ctop < MAY_SIZE - DStack Array Exptop J = value; else System. at. println C" Stack is full. Cannot push more down (a) Suppress Warnings ("unchecked") public Tpop () 4 If (top >=0) retorn (1) stack Array (tay --); else 9 System out . print n (" stack is empty, count pop more element 5): roturn null; bool can is full) &

Extern top == MAX -5128-1;

```
class generics &
public state visit main (strang [] args) &
      Cremeric Stack Clusteger Studies stack = now Concrec Stack = ) =
        Converse Stack & Pouble > double stack = new Generic Stack (>0);
      for (ht i=1; 165; it+ ) {
          i steger Stack. pesh (i)
       for (double i=1.0; ic=5.0; i++) q
              donble Stack . push (i)
      System and position lopped integers from the Stuck :");
        while (Integer Stack . Is Empty 1)) &
         System. out. PM & In ( Integer Stack . pop()):
         System . est printly ( " Popped doubles from the starte")
          white 1's alpuble stack. is Empty() $
                System. out. printly ( double Stack pop())
          3 System out proth C"Sohan A R - 18marcs 285 ")
                                              (6/1/24
  Rugat: Sohan A R. - 18m22 18m22 CS285
   paped integers from the stock:
```

Popped dables from the stack
5.0
4.0
3.0
2.0

1.0

I Crede a padrage CIE which has two classes - student and otherwards. The class student has members like use , none , sum. The class Internal derived from student has an array that stores the internal marks scored in five courses of the current semester of the student - Create another padrage SER which has the class Enternal which is a derived class of Student. This class has an array last stores the SER marks scored in five courses of the current seminary to the student. Import the two packages in a file that declares to find marks of a students in all five courses.

Process installed internals. java:

Package CIE;

import java. util. Scanner;

public class Internals extends Studients

protected Ind marks[] = new and CS];

public Internals () {

11 constructor.for Internals

3

public void input ClEmarks () {

```
Scapner Scanner = new Scanner (System. In);
    System-out-printly ("Enter Internal Marks for" + name);
       for (mt 1:0; i = 5; if 1) &
            System and - print ("subject" + lift) + "morbes:"):
           marks (1) = scanne - need Int ();
student para
 import java- will Sconner;
   public class Student &
           protected String usn = new String () >
           proetected String name = new String ();
           protested in sem;
    Public void mpt student Details (5 &
          Sconner scomer = new Scanner ( System. in );
           System. ent. point ("Enter USN:");
            Usn = Sconner next ();
            System out printly ("Enter Name: ") -
            Qu name = scanner. rest ();
             System. out. print ("Fenter Semester.");
                sem = slannor next It ();
          public void display Student Details () &
                 System - out · print In ("USN: "+ Usn);
                  System.out. Println(" Name: "+ name);
```

```
System. put. printin ("Semester: "+ seur):
Endernals gara
  package SER;
   Import C16. Indernals;
   Import java edil-Source >
  public class Enternals extends Internal sa
      protected wt morks []:
       protected but find Marks ();
   · public Enternals () &
         Marks & Mew Int C5 );
        And Marks = new Int C5 );
    public void input SEE morks () à
          Scanner se aurer = new Scanner (system. in );
           System . Out grintly & Exter Sfle marks for "+ name);
          for listizo; ics jitt )
               System out-print ("Subject") + (+1)+"mar hs:"
                marks [i] = scanner . next Int ();
           public void Calculate final Marker () &
                   for (thti=0; ic5; i+1)
                       find Marks (i) = marks (i) ) 2 + super a market
```

public rord display Final Marks () & Chisplay Student Details (); for list izo; ics; iff) System.out, printly ("Subject" + (it 1) +": "+ final Marks (i7) Main . Java: mport SEE-Enternals; public Class Main & public state c moid main (string args (7) & ant num of students = 2: Externals findMarks [7 = new Enternals [num of students]; for Cut i = 0; i = numof students; it +) § find Marks (1) = new Enternals() And Martis (i) ment student stails (); System. out print In ("Entir CIE marks"), frad Marks () importing marks (); System out printle ("Enter SEE morks"); final Marks (i). input SEE marks (); System. ent. postln ("Displaying data: In"); for listing is number students; it as of final Marks (i) - calculate Final Marks (); freal Marks (i) - display Final Marks (); System ent-printing " Socian AR-18mon C5285")

Dupy - Sohan AR - 1BM2765785 Enter USN: 111 Enter Name: Soh Ada Simester: 2 Enter Ole marks Enter Internal Marks for soh Subject 1 marks: 222 Subject 2 marks: 211 Subject 3 marks: 44 Subject 4 marks: 3) Subject 5 marks: 2 Enter SEE marks leter SEE marks for soh Subject Imarks: 111 Subject 2 monts: 3 Subject 3 mosts: 3

Subject 4 marks : 3 Subject 5 marks : 3

Note a program that demonstrates handling of exceptions in Inheritance tre LAB PROGRAM - 7 · Create a base class colled "Father" and derived class called "Son" which entends the base class. In father class, implement a constructor which takes the age and throws the englesception Wring tgel) when the impo ago < 0. In son class, implament an constructor that cases both for and son's age and throws on exception of son's age is >= father say import java . util-Scanner; public closs Exception Inhart once of static class father & istages foother list aug e) throws hirong Ag e &
if Cage < 0) & throw new wrong Age ("Father's age count be regative") g this og l = oge > statec class son & Father forther; Son Out father Age, it son Age) throws Wrong Age ? father = new Father (fother Age); if (sm Age >= father.age) & throw now Wrong Age C'son's age cannot be equal or gre than father's age);

this age = son Age; static class Wrong Age entends foccoption a Wrong Age (String mussage) & super (message) Public static rold main (String () args) 5 Scamer = new Scanner (System in); Systom - out-print in 1" Enter father sage:"); int father Age = scanner next Int (); System. out. partly ("Enter son's ag ()); int son Age = Scannu-heat 2nd Cl Sox son = new son (father Age, son trye); System.out.println ("Som's age.") + son.age); costin @ (Wrong Age e) & System. out. printin (e.g.d Mes sage()): System. out. printin (ei Sohan A R - 18m22cs285"); : total Enter follow's age: Cater sonts age Sm's age cannot be equal or greater thanfathers age write a program which creates two threads, one thread displaying "BMS college of Engineering" onle every ten sounds and another daplay " (SE and every two seconds. Class Display Message Thread extends Thread & private final string message;
private final long interval; Display Message Throad CString message, long interval I & this message = message; this minterval = interval; public verd run () { try & while(fre) & System. Ant. print (n (message);
Thread. sleep (interval); op catch CInterropted Exception e) { System. out. printly (Thread. current/hread () get Name () relutery public class Two thread Demo & public static void mouth (string [] args) & Display laters age thread thread 1 - new Display Mussage Thread ("Ishes al of Engineering, 10000); Display Message Thread thread 2 - new Display Message Thread ("Ist", 2

Unad 1-set Name (" Thread 1"); thread 2 - set Name ("Thread 2"). thread (start () tread? - start ()= try & Thread slep (milles: 30000); eat in Contaryold Exception e > 2 System. ord-printly (i man gread interropted "); threwood 1. Interrupt (5; thread winterrypt(); System. out proten ("Main thorad enoting");

y System. out proten ("Sohan AR - 118m 22C5285"); Dutpot Bor 3 College of Engineering CSE (SE CSE Brus college of lengthourous CSE CSE CSK

13.02.24

```
LAK-10:
Demonstrate Inter process Communication and Deadlock
  Closs 9. 9
    int n;
   boolean valueSet = false;
    Syndronized int gol ( ) ?
     whole (b value set )
      trys
     System -oit - protty (" In Greener Wasting Vi");
       mart ()
     I catch (Exterrupted Exception e) 9
         System-out-privath (" Zutor rupled Exception caught");
        System. at . prixtn L'that: "tr);
         value set = false;
         System. ent. printh (" In Intimate Predocer ("");
          notify ();
         return n;
        syndronised void put (int a) &
        whole (value St)
          tryd
           Sistem. out-print la (" In Preducer wanting ("):
           nort();
          takes at my total Cintempted Enception e ) &
           System out - print in ( 1' Interrupted Exception cought " ):
```

thrs.a-n, Value Set = true ; System.out. print(ulipet: "+"); System. out print hell in Intimate Consumer (n'); Clais Producer implements Runnable T day / Producula q) 2 flosoq, = a; New Threwolfhis, "producer"). start (); public vord runl) { 141-07 NWILLICIS) & of System-out. protein (11 Sohan AR - 1BM 22CS 285") closs Pl fined & loss consumer implements Runnable & public static word mound strong agest. 2 dy = nensac); consumer can) & new poduce (4); new Thresol (this, "(onsomer"). start (); this . q = q) new Consumer Cy): System out - printing Press Condrol-16 public vord run L) 2 int 1 = 0% Output: Solan AR-1BM22C5285 NM1 (1215) 9 INT = 9.94 (); System - out . print by Cutonsumed 11 x1); Press Entroll to stop Citus Intrinate Customer Producer waiting not +0 Entimate product Pot = 1

```
Program to Domanytrate Deadlack:
   class 4 2
    Syndronized vold for (B-6) &
    string name = Throad Corrent Thread () get Name (1)
     system and printly (name & "entered A - foo")
      trys
      Thread sleep (1000) =
      Jest ch (Facoption e) &
        Systemat printer ("A Interrupted")
      System. ent, pront In (name + "trying to call B. last ()");
b. lost ();
       void lost () {
       System. and. printin ["Inside Atost").
     Class B &
      synderal and void bor Ha Ja
       string have = Thread current thread ()-got Name ();
       System.out. pried la Cnane + "entered R. box 15-,
        Thread - Sleep (1000);
       3 Cutch (Exception e) &
         System.out-println("BInterrupted"),
        Bydem. out-provid in Chame + liftying to call A. Lost (1");
           a lost (s)
        vord lost ( ) §
          System.out. print In ("Inside A. last");
```

closs Deadlock Implements Runnows L An show Al); Bb=new 13(). Thread corrent Thread () set Name ("Morn Thread"); Peadlock (12 Thread t = new Thread (this , "Routing Thread") 4. starte); a. foolb); Itget (och on a In this thread System.out. prind(n("Back in main thread"); Public void run () 9 6. barla); 1/ get lock en bin. o Mer thread. System . art . print h C' Back in other thread "); public Static votal moun (stilling angs (D) &
new Deuthold [J=
y System.out.printle ("Sohan AR - 18 m22cs 285"); Entpot: 5 Man 4 R - 18m 22 (5285 Main Thread extered A-foo Racing Chread extered B-har Main Thread fryigto call B-last () InstOf A. last Back on mountree of Rowing throad trying to call Alast () Insided wat Baken other throad.

WAP that creates a user interfall to perform integer divisions. The user enters two numbers in the tendfilds, Num I and Num 2. The division of Num) and Num? is displayed in the Result field when the devide button I is circled. If Num I or Num? were not an integer, the program would throw a Number format Euception. If Num? were Zere, the program would throw an anythmetric and also Disable the would throw an arithmetic Exception Display the exception in a missage dialing book. import javan swing. " import java.awt. ";
import java.ant. event. "; Class Swing Demo & Swing Remo 1) & 11 creat i jframe contail ner I Frame ifrm = new I frame C'Divder App "); j frm. set Size [795, 150); i)frm-satlayout (new Flow layout ()); 11 to terminate on close jfr m. set Défault (le se Sporation (J frame. EX 17-ON-CLOSE) 11 tent label I label j'lab = new I label (" fater divisor and dividend ")-Il add text field for both numbers 3 Textfield ait f = New J Text field 18); Trentfield bitf = new 3[entfreed (8);

```
16 Calc button
 J Botton button = news Button (" Calculate") >
1 labels
 Jlabola err = new Jlabel ();
  I label alab = new I label ();
  I label blab = new I label () >
  Ilabel anslab = newTlabel ():
Madd in order: )
  j-from add (en) : // to desplay oror
  ifim add Cjlab);
  ifin add ( ajtf);
  Ifrm add (bitf) -
                                                      CO - C & BLY
  jfrm. add (batton);
   ifrm. add (alab );
   ifrm. add (blab);
   jfrm -add Comblab)
  Actronlistner 1 = new Actronlistner 1) &
           public vor d'action l'expormed Chitron Event eNt) à
3 System. ont. print lu C'édetion event from a text field ");
     ajtf-add Action listerer (1);
     by to fada Action Listoner (1);
 button add Action Listener Crew Action listener CS &
          public void action Performed (Action Event ext) &
             try ? Int a = Integer - parx Int lajtf-get Text (1);
int 6 - Integer - parx Int (bjtf-get Text ());
int as - a 16;
                     alabisatest C" (nA = "+a);
blab set test C" (nB = "+b) >
                     are lab . set Tent (" In Aug = " + Aug );
```

coatch Carothandre Exception e) = alob saturt (""); blab sollend (" "); anslab settent ("")> errsetzent (" B should be NON Zero 6") -// display franc) from set visible (five) public static rold main (string ags (7)) 11 create frame on event disputching thread 3wmg stillities. invoke later (new Runnable) & public vord run () & New Swing Domold's lots & by . tuptul. A THE STREET Divider APP Enter the Invider and divided [colculate A = 200 B = 20 Aug = 10

Explaination:

I frame : represent main windows of application

I label: used to display test labels on GUI

add (): This is used to add a Swing componed Coutton plabel, text field)
to a container (I frame)

Set had (text): It is used to set the text of tent based components Commands

Jeal) to specified string

get Tent (): It retreives test from text boxed on component

set layout Colyout Monager Layout): It was sets loyout manger for container responsible for arranging clements touside it.

set visible (boolean visible): It sets visibility of component. when true component and consult become visible on hidaw when set to fact

20/2/24

1. 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 discriminate b 2-4ac is negative, display a message stating that there are no real solutions

```
import java.util.Scanner;
class Quadratic {
  int a, b, c;
  double r1, r2, d;
  void getd() {
    Scanner s = new Scanner(System.in);
    System.out.println("Enter the coefficients of a,b,c");
    a = s.nextInt();
    b = s.nextInt();
    c = s.nextInt();
  }
  void compute() {
    while (a == 0) {
      System.out.println("Not a quadratic equation");
      System.out.println("Enter a non zero value for a:");
      Scanner s = new Scanner(System.in);
      a = s.nextInt();
    d = b * b - 4 * a * c;
    if (d == 0) {
      r1 = (-b) / (2 * a);
      System.out.println("Roots are real and equal");
      System.out.println("Root1 = Root2 = " + r1);
    } else if (d > 0) {
      r1 = ((-b) + (Math.sqrt(d))) / (double) (2 * a);
```

```
r2 = ((-b) - (Math.sqrt(d))) / (double) (2 * a);
       System.out.println("Roots are real and distinct");
       System.out.println("Roo1 = " + r1 + " Root2 = " + r2);
     } else if (d < 0) {
       System.out.println("Roots are imaginary");
       r1 = (-b) / (2 * a);
       r2 = Math.sqrt(-d) / (2 * a);
       System.out.println("Root1 = " + r1 + " + i" + r2);
       System.out.println("Root1 = " + r1 + " - i" + r2);
    }
  }
}
class QuadraticMain {
  public static void main(String args[]) {
     Quadratic q = new Quadratic();
    q.getd();
    q.compute();
    System.out.println("Sohan A R -1BM22CS285");
  }
}
```

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 Subject {
  int subjectMarks;
  int credits;
  double grade;
}
class Student {
  String name;
  String usn;
  double SGPA;
  Scanner s;
  Subject[] subjects;
  Student() {
    int i;
    subjects = new Subject[9];
    for (i = 0; i < 9; i++)
      subjects[i] = new Subject();
    s = new Scanner(System.in);
  }
  void getStudentDetails() {
    System.out.println("Enter Student Name:");
    name = s.nextLine();
```

```
System.out.println("Enter USN:");
  usn = s.nextLine();
}
void getMarks() {
  for (int i = 0; i < 8; i++) {
    System.out.println("Enter marks for Subject" + (i + 1) + ":");\\
    subjects[i].subjectMarks = s.nextInt();
    System.out.println("Enter credits for Subject " + (i + 1) + ":");
    subjects[i].credits = s.nextInt();
    subjects[i].grade = subjects[i].subjectMarks / 10.0 + 1.0;
  }
}
void computeSGPA() {
  double totalCredits = 0;
  double weightedSum = 0;
  for (int i = 0; i < 8; i++) {
    totalCredits += subjects[i].credits;
    weightedSum += subjects[i].credits * subjects[i].grade;
  }
  SGPA = weightedSum / totalCredits;
}
void displayResult() {
```

```
System.out.println("Student Name: " + name);
    System.out.println("USN: " + usn);
    System.out.println("SGPA: " + SGPA);
 }
}
public class main{
 public static void main(String[] args) {
    Student s1 = new Student();
    s1.getStudentDetails();
    s1.getMarks();
    s1.computeSGPA();
    s1.displayResult();
System.out.println("Sohan A R -1BM22CS285");
 }
}
```

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.

```
import java.util.Scanner;
class Books
{
       String name;
       String author;
       int price;
       int numPages;
       Books(String name, String author, int price, int numPages)
       {
                this.name=name;
                this.author=author;
                this.price=price;
                this.numPages=numPages;
       }
       public String toString()
       {
                String name, author, price, numPages;
                name="Book name:" +this.name+ "\n";
                author="Author name:" +this.author+ "\n";
                price="Price:" +this.price+ "\n";
                numPages="Number of pages:" +this.numPages+ "\n";
                return name+author+price+numPages;
       }
}
```

```
public class Mainbook
{
        public static void main(String args[])
        {
                Scanner s=new Scanner(System.in);
                int n;
                int i;
                String name;
                String author;
                int price;
                int numPages;
                System.out.println("Enter the number of books:");
                n=s.nextInt();
                Books b[];
                b=new Books[n];
                for(i=0;i<n;i++)
                        System.out.println("Enter the details of book" + (i+1) + ":");
                        System.out.println("Enter the name of the book:");
                        name=s.next();
                        System.out.println("Enter the author name:");
                        author=s.next();
                        System.out.println("Enter the price:");
                        price=s.nextInt();
                        System.out.println("Enter the number of pages:");
                        numPages=s.nextInt();
```

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.

```
import java.util.*;
import java.math.*;
class InputScanner {
  Scanner sc;
  InputScanner() {
    sc = new Scanner(System.in);
  }
}
abstract class Shape extends InputScanner {
  double a;
  double b;
  abstract void getInput();
  abstract void displayArea();
}
class Rectangle extends Shape {
  void getInput() {
```

```
System.out.println("Enter the length and breadth:");
     a = sc.nextDouble();
     b = sc.nextDouble();
  }
  void displayArea() {
    System.out.println("Area of rectangle is:" + (a * b));
  }
}
class Triangle extends Shape {
  void getInput() {
    System.out.println("Enter the length and height:");
    a = sc.nextDouble();
     b = sc.nextDouble();
  }
  void displayArea() {
    System.out.println("Area of triangle is:" + (a * b * 0.5));
  }
}
class Circle extends Shape {
  void getInput() {
    System.out.println("Enter the radius:");
    a = sc.nextDouble();
  }
  void displayArea() {
    System.out.println("Area of circle is:" + (a * a * Math.PI));
  }
```

```
class ShapeMain {
  public static void main(String[] args) {
    Rectangle r = new Rectangle();
    Triangle t = new Triangle();
    Circle c = new Circle();
    r.getInput();
    r.displayArea();
    t.getInput();
    t.displayArea();
    c.getInput();
    c.displayArea();
    System.out.println("Sohan A R -1BM22CS285");
}
```

}

}

- 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.

```
import java.util.Scanner;

class account {
    String name;
    int accno;
    String type;
    double balance;

account(String name, int accno, String type, double balance) {
        this.name = name;
        this.accno = accno;
        this.type = type;
        this.balance = balance;
    }

void deposit(double amount) {
```

```
balance += amount;
  }
  void withdraw(double amount) {
    if ((balance - amount) >= 0) {
      balance -= amount;
    } else {
      System.out.println("Insufficient balance,cant withdraw");
    }
  }
  void display() {
    System.out.println("Name:" + name + "\nAccno:" + accno + "\nType:" + type + "\nBalance:" +
balance);
 }
}
class savAcct extends account {
  private static double rate = 5;
  savAcct(String name, int accno, double balance) {
    super(name, accno, "Savings", balance);
  }
  void interest() {
    balance += balance * (rate) / 100;
    System.out.println("Balance:" + balance);
  }
```

```
}
class curAcct extends account {
  private double minBal = 500;
  private double serviceCharges = 50;
  curAcct(String name, int accno, double balance) {
    super(name, accno, "Current", balance);
  }
  void checkmin() {
    if (balance < minBal) {
      System.out.println("Balance is less than min balance, service charges imposed:" +
serviceCharges);
      balance -= serviceCharges;
      System.out.println("Balance is:" + balance);
    }
  }
}
class Bank {
  public static void main(String a[]) {
    Scanner s = new Scanner(System.in);
    System.out.println("Enter the name,type(current/savings),account number,initial balance:");
    String name = s.next();
    String type = s.next();
```

```
int accno = s.nextInt();
double balance = s.nextDouble();
int ch;
double amount1, amount2;
account acc = new account(name, accno, type, balance);
savAcct sa = new savAcct(name, accno, balance);
curAcct ca = new curAcct(name, accno, balance);
while (true) {
 if (acc.type.equals("savings")) {
    System.out.println("\nMenu\n1.deposit 2.withdraw 3.compute interest 4.display");
    System.out.println("Enter the choice:");
    ch = s.nextInt();
    switch (ch) {
      case 1:
        System.out.println("Enter the amount:");
        amount1 = s.nextInt();
        sa.deposit(amount1);
        break;
      case 2:
        System.out.println("Enter the amount:");
        amount2 = s.nextInt();
        sa.withdraw(amount2);
        break;
      case 3:
        sa.interest();
        break;
      case 4:
        sa.display();
        break;
      case 5:
        System.exit(0);
```

```
default:
      System.out.println("invalid input");
      break;
  }
} else {
  System.out.println("\nMenu\n1.deposit 2.withdraw 3.display");
  System.out.println("Enter the choice:");
  ch = s.nextInt();
  switch (ch) {
    case 1:
      System.out.println("Enter the amount:");
      amount1 = s.nextInt();
      ca.deposit(amount1);
      break;
    case 2:
      System.out.println("Enter the amount:");
      amount2 = s.nextInt();
      ca.withdraw(amount2);
      ca.checkmin();
      break;
    case 3:
      ca.display();
      break;
    case 4:
      System.exit(0);
    default:
      System.out.println("Invalid input");
      break;
      System.out.println("Sohan A R -1BM22CS285");
  }
```

}

} }

NUMBER SORTING

```
import java.util.Arrays;
public class NumberSorting {
  public static void main(String[] args) {
    // Create an array of Integer objects with numbers from 10 to 1
    Integer[] numbers = new Integer[] { 10, 9, 8, 7, 6, 5, 4, 3, 2, 1 };
    // Sorting the array in ascending order using Arrays.sort()
    Arrays.sort(numbers);
    // Displaying the sorted numbers
    System.out.println("Sorted Numbers (Ascending Order):");
    for (Integer number: numbers) {
      System.out.print(number + " ");
    }
    System.out.println(); // New line for better readability
    // Sorting the array in descending order using a custom comparator
    Arrays.sort(numbers, (a, b) -> b.compareTo(a));
    // Displaying the sorted numbers in descending order
    System.out.println("Sorted Numbers (Descending Order):");
    for (Integer number : numbers) {
      System.out.print(number + " ");
    }
  }
}
```

GENERICS

```
class GenericStack<T> {
  private Object[] stackArray;
  private int top = -1;
  private static final int MAX_SIZE = 5;
  public GenericStack() {
    stackArray = new Object[MAX_SIZE];
  }
  public void push(T value) {
    if (top < MAX_SIZE - 1) stackArray[++top] = value;</pre>
    else System.out.println("Stack is full. Cannot push more elements.");
  }
  @SuppressWarnings("unchecked")
  public T pop() {
    if (top >= 0)
      return (T) stackArray[top--];
    else {
      System.out.println("Stack is empty. Cannot pop more elements.");
      return null;
    }
  }
  public boolean isEmpty() {
    return top == -1;
  }
  public boolean isFull() {
    return top == MAX_SIZE - 1;
```

```
}
}
class Main{
public static void main(String[] args) {
    GenericStack<Integer> integerStack = new GenericStack<>();
    GenericStack<Double> doubleStack = new GenericStack<>();
    // Push integers to the integer stack
    for (int i = 1; i <= 5; i++) {
      integerStack.push(i);
    }
    // Push doubles to the double stack
    for (double i = 1.0; i \le 5.0; i++) {
      doubleStack.push(i);
    }
    // Pop and print integers from the integer stack
    System.out.println("Popped integers from the stack:");
    while (!integerStack.isEmpty()) {
      System.out.println(integerStack.pop());
    // Pop and print doubles from the double stack
    System.out.println("Popped doubles from the stack:");
    while (!doubleStack.isEmpty()) {
      System.out.println(doubleStack.pop());
    }
  }
}
```

```
Abstract class prog
import java.lang.Math;
abstract class Shape {
  double a;
  double b;
  double c;
  abstract void calculateArea();
  abstract void calculatePerimeter();
}
class Triangle extends Shape {
  Triangle(double x, double y, double z) {
    a = x;
    b = y;
    c = z;
  }
  void calculateArea() {
    double s = (a + b + c) / 2;
    System.out.println("Area="+(Math.sqrt(s*(s-a)*(s-b)*(s-c))));\\
  }
  void calculatePerimeter() {
    System.out.println("Perimeter=" + (a + b + c));
  }
}
class Circle extends Shape {
```

```
Circle(double r) {
    a = r;
  }
  void calculateArea() {
    System.out.println("Area=" + (Math.PI * a * a));
  }
  void calculatePerimeter() {
    System.out.println("Perimeter=" + (2 * Math.PI * a));
  }
}
class ShapeM {
  public static void main(String[] args) {
    Triangle t = new Triangle(2.0, 3.0, 5.0);
    Circle c = new Circle(5.0);
    t.calculateArea();
    t.calculatePerimeter();
    c.calculateArea();
    c.calculatePerimeter();
    System.out.println("Sohan A R -1BM22CS285");
  }
}
```

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

```
package CIE;
import java.util.Scanner;
public class Internals extends Student {
  protected int marks[] = new int[5];
  public void inputCIEmarks() {
     Scanner s = new Scanner(System.in);
     System.out.println("Enter Internal Marks for " + name);
     for (int i = 0; i < 5; i++) {
       System.out.print("Subject " + (i + 1) + " marks: ");
       marks[i] = s.nextInt();
    }
  }
}
package CIE;
import java.util.Scanner;
public class Student {
  protected String usn = new String();
```

```
protected String name = new String();
  protected int sem;
  public void inputStudentDetails() {
    Scanner s = new Scanner(System.in);
    System.out.print("Enter USN: ");
    usn = s.next();
    System.out.print("Enter Name: ");
    name = s.next();
    System.out.print("Enter Semester: ");
    sem = s.nextInt();
  }
  public void displayStudentDetails() {
    System.out.println("USN: " + usn);
    System.out.println("Name: " + name);
    System.out.println("Semester: " + sem);
  }
}
package SEE;
import CIE.Internals;
import java.util.Scanner;
public class Externals extends Internals {
  protected int marks[];
  protected int finalMarks[];
  public Externals() {
    marks = new int[5];
```

```
finalMarks = new int[5];
  }
  public void inputSEEmarks() {
    Scanner s = new Scanner(System.in);
    System.out.println("Enter SEE Marks for " + name);
    for (int i = 0; i < 5; i++) {
      System.out.print("Subject " + (i + 1) + " marks: ");
      marks[i] = s.nextInt();
    }
  }
  public void calculateFinalMarks() {
    for (int i = 0; i < 5; i++)
      finalMarks[i] = marks[i] / 2 + super.marks[i];
  }
  public void displayFinalMarks() {
    displayStudentDetails();
    for (int i = 0; i < 5; i++)
      System.out.println("Subject " + (i + 1) + ": " + finalMarks[i]);
  }
import SEE.Externals;
public class Pkgmain {
  public static void main(String args[]) {
    int numOfStudents = 2;
    Externals finalMarks[] = new Externals[numOfStudents];
    for (int i = 0; i < numOfStudents; i++) {
```

}

```
finalMarks[i] = new Externals();
  finalMarks[i].inputStudentDetails();
  System.out.println("Enter CIE marks");
  finalMarks[i].inputCIEmarks();
  System.out.println("Enter SEE marks");
  finalMarks[i].inputSEEmarks();
}

System.out.println("Displaying data:\n");

for (int i = 0; i < numOfStudents; i++) {
  finalMarks[i].calculateFinalMarks();
  finalMarks[i].displayFinalMarks();
  System.out.println("Sohan A R -1BM22CS285");
}
}</pre>
```

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.
import java.util.Scanner;
public class ExceptionInheritance {
  static class Father {
    int age;
    Father(int age) throws WrongAge {
      if (age < 0) {
        throw new WrongAge("Father's age cannot be negative.");
      }
      this.age = age;
    }
  }
  static class Son {
    int age;
    Father father;
    Son(int fatherAge, int sonAge) throws WrongAge {
      father = new Father(fatherAge);
      if (sonAge >= father.age) {
         throw new WrongAge("Son's age cannot be equal or greater than father's age.");
```

```
}
    this.age = sonAge;
  }
}
static class WrongAge extends Exception {
  WrongAge(String message) {
    super(message);
  }
}
public static void main(String[] args) {
  Scanner scanner = new Scanner(System.in);
  System.out.println("Enter father's age: ");
  int fatherAge = scanner.nextInt();
  System.out.println("Enter son's age: ");
  int sonAge = scanner.nextInt();
  try {
    Son son = new Son(fatherAge, sonAge);
    System.out.println("Son's age: " + son.age);
  } catch (WrongAge e) {
    System.out.println(e.getMessage());
    System.out.println("Sohan A R -1BM22CS285");
  }
}
```

}

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.

```
class DisplayMessageThread extends Thread {
  private final String message;
  private final long interval;
  DisplayMessageThread(String message, long interval) {
    this.message = message;
    this.interval = interval;
  }
  public void run() {
    try {
      while (true) {
        System.out.println(message);
        Thread.sleep(interval);
      }
    } catch (InterruptedException e) {
      System.out.println(Thread.currentThread().getName() + " interrupted.");
    }
  }
}
public class TwoThreadDemo {
  public static void main(String[] args) {
    DisplayMessageThread thread1 = new DisplayMessageThread("BMS College of Engineering",
10000);
    DisplayMessageThread thread2 = new DisplayMessageThread("CSE", 2000);
    thread1.setName("Thread 1");
    thread2.setName("Thread 2");
```

```
thread1.start();
thread2.start();

try {
    Thread.sleep(30000);
} catch (InterruptedException e) {
    System.out.println("Main thread interrupted.");
}

thread1.interrupt();
thread2.interrupt();

System.out.println("Main thread exiting.");
System.out.println("Sohan A R -1BM22CS285");
}
}
```

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

```
import javax.swing.*;
import java.awt.*;
import java.awt.event.*;
class SwingDemo {
  SwingDemo() {
    // create jframe container
    JFrame jfrm = new JFrame("Divider App");
    jfrm.setSize(275, 150);
    jfrm.setLayout(new FlowLayout());
    // to terminate on close
    jfrm.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
    // text label
    JLabel jlab = new JLabel("Enter the divider and divident:");
    // add text field for both numbers
    JTextField ajtf = new JTextField(8);
    JTextField bjtf = new JTextField(8);
    // calc button
    JButton button = new JButton("Calculate");
    // labels
    JLabel err = new JLabel();
    JLabel alab = new JLabel();
```

```
JLabel blab = new JLabel();
JLabel anslab = new JLabel();
// add in order :)
jfrm.add(err); // to display error bois
jfrm.add(jlab);
jfrm.add(ajtf);
jfrm.add(bjtf);
jfrm.add(button);
jfrm.add(alab);
jfrm.add(blab);
jfrm.add(anslab);
ActionListener I = new ActionListener() {
  public void actionPerformed(ActionEvent evt) {
    System.out.println("Action event from a text field");
  }
};
ajtf.addActionListener(I);
bjtf.addActionListener(I);
button.addActionListener(new ActionListener() {
  public void actionPerformed(ActionEvent evt) {
    try {
       int a = Integer.parseInt(ajtf.getText());
       int b = Integer.parseInt(bjtf.getText());
       int ans = a / b;
       alab.setText("\nA = " + a);
       blab.setText("\nB = " + b);
       anslab.setText("\nAns = " + ans);
```

```
} catch (NumberFormatException e) {
         alab.setText("");
         blab.setText("");
         anslab.setText("");
         err.setText("Enter Only Integers!");
      } catch (ArithmeticException e) {
         alab.setText("");
         blab.setText("");
         anslab.setText("");
         err.setText("B should be NON zero!");
      }
    }
  });
  // display frame
  jfrm.setVisible(true);
}
public static void main(String args[]) {
  // create frame on event dispatching thread
  SwingUtilities.invokeLater(new Runnable() {
    public void run() {
      new SwingDemo();
   System.out.println("Sohan A R -1BM22CS285");
    }
  });
}
```

}

10a) Interprocess communication using consumer and producer

```
class Q {
  int n;
  boolean valueSet = false;
  synchronized int get() {
    while (!valueSet)
      try {
         System.out.println("\nConsumer waiting\n");
         wait();
      } catch (InterruptedException e) {
         System.out.println("InterruptedException caught");
      }
    System.out.println("Got: " + n);
    valueSet = false;
    System.out.println("\nIntimate Producer\n");
    notify();
    return n;
  }
  synchronized void put(int n) {
    while (valueSet)
      try {
         System.out.println("\nProducer waiting\n");
         wait();
      } catch (InterruptedException e) {
         System.out.println("InterruptedException caught");
      }
    this.n = n;
    valueSet = true;
    System.out.println("Put: " + n);
```

```
System.out.println("\nIntimate Consumer\n");
    notify();
  }
}
class Producer implements Runnable {
  Qq;
  Producer(Q q) {
    this.q = q;
    new Thread(this, "Producer").start();
  }
  public void run() {
    int i = 0;
    while (i < 6) {
      q.put(i++);
    }
  }
}
class Consumer implements Runnable {
  Qq;
  Consumer(Qq) {
    this.q = q;
    new Thread(this, "Consumer").start();
  }
  public void run() {
    int i = 0;
```

```
while (i < 6) {
       int r = q.get();
      System.out.println("consumed:" + r);
       i++;
    }
  }
}
class PCFixed {
  public static void main(String args[]) {
    Q q = new Q();
    new Producer(q);
     new Consumer(q);
    System.out.println("Press Control-C to stop.");
    System.out.println("Sohan A R -1BM22CS285");
  }
}
```

10b) Deadlock

```
class A {
  synchronized void foo(B b) {
    String name = Thread.currentThread().getName();
    System.out.println(name + " entered A.foo");
    try {
      Thread.sleep(1000);
    } catch (Exception e) {
      System.out.println("A Interrupted");
    }
    System.out.println(name + " trying to call B.last()");
    b.last();
  }
  void last() {
    System.out.println("Inside A.last");
  }
}
class B {
  synchronized void bar(A a) {
    String name = Thread.currentThread().getName();
    System.out.println(name + " entered B.bar");
    try {
      Thread.sleep(1000);
    } catch (Exception e) {
      System.out.println("B Interrupted");
    System.out.println(name + " trying to call A.last()");
    a.last();
  }
```

```
void last() { System.out.println("Inside
    B.last");
  }
}
class Deadlock implements Runnable {
  Aa = new A();
  Bb = new B();
  Deadlock() { Thread.currentThread().setName("MainThread");
    Thread t = new Thread(this, "RacingThread"); t.start();
    a.foo(b); // get lock on a in this thread.
    System.out.println("Back in main thread");
  }
  public void run() {
    b.bar(a); // get lock on b in other thread.
    System.out.println("Back in other thread");
  }
  public static void main(String args[]) { new
    Deadlock();
    System.out.println("Sohan A R -1BM22CS285");
  }
}
```