## B.M.S. College of Engineering (Autonomous Institution affiliated to VTU, Belagavi)

**Department of Computer Science and Engineering** 



## **OOJ Laboratory**

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```
lat 1 - 12/12/2023
                            WA12-12-23
Quadratic remation
infort java. util. Scanner;
class Quadratic
  (- Scanner Scan = new Scanner (System. in);
 public void compute (int a, int b, int c)
    while (a = = 0)
    System. out . println ("Enter a non zero value tod a:");
    a = scan . nentInt();
   int d = b x b - 4xaxc;
   iff double 81=0.0, 42=0.0;
   (0==b) pi
     r1= -b/(2 *a);
     System . out . printle ("Roots are real and equal.");
    System. out. printly ("Root a1 = Root 2 = "+ root 1);
  else if (d>0)
    71=((-b) + math-sqxt(d))/(2+a);
    72=((-6) = - math-sqrt(d))/(2*a);
    System. out-preinthe ("Roots are real and distinct.");
    System. Out. println ("Root 1 = " + most r1 + "Root 2="+r2)
 else if(dco)
  System. out. peu ntln ("Roots are imaginary.");
```

```
71=-b/(2xa);
 12 = Math. sqrt (-d) /(2 xa).
 System - out. printle ("Root 1 = "+ +1+ " " " 1 + 72).
 System. out- pecintle ("Root 2="+ 81 0- "1"+ 82).
 public static void main (String args [7)
   & inta, b, c;
    System-out-println (" Enter the co-efficients a,
                           b and c of a quadratic equal.
    a = scan. next Int ();
    b = Scan- next Int ();
    C=ccan . next Int ();
   Quadratic q = new Quadratic();
    9. compute (Ba, b, c);
                            <- System. Out. perintly ("Snela N
                                                Shastri - 18M2
  Output 1:
  Enter the co-efficients of a , b and c of a quadratic
  Roots are real and distinct
  Root 1 = -0.2 Root 2 = -1.0
  Output 2:
  Enter the co-efficients of a,6 and c of a quadratic
```

```
hook are real and equal
not 1 = Root 2 = 2.0
         coefficients of a, b and c of a quadratic
nter the
quation:
cots are imaginary
Root 1 = 0.0+ i0.8666254637844386
pact 2 = 0.0 - 10-8660254037844386
Sneha N Shastri - 1BM22CS283
Parse Int demo
find area of rectangle and verify the same with various inputs (renoth, brendth)
class Rectangle Area
 public static void main (String args[])
 I'm length, breadth;
 length = Integer. parse Int (args [0]);
 breadth = Integer. parse Int (args[6]);
 int area = length x broadth;
 System-out-printh ("Length of rectangle: "+ length);
 System. out. printly (" Longth of rectangle: "+ breadth);
 Eystem. out. printle (" Brea = " + area);
 Sutput:
 longth of rectangle: 1
  Breadth of rectangle: 2
```

(2) Lab 2 - 19/12/2023 KA19-12-23

1. Develop a Jova program to create a class Structured with numbers uson, name, an array credit and an array makes. Include methods to accept and display details and a method to Calculate SGPA of a student.

SGPA = 5 (course credits) (Grade Points)

E (course Credits)

public class Subject

{
 int subjectmarks;
 int coedits;
 int grade;
 }

import java-util-Scanner; public class Student

Subject sub []; String name; String usn; double segpa; Scanner Scan=new Scanner (System.in);

Student ()

sub = new Subject [8]; for (int i=0; ic 8; i++) f sub [i] = new Subject (); scorn = new Scarmer (System in );

```
whice void get Student Details ()
System, out, perint lu ("Enter
nome = scan next Line ();
System-out. printly ("Enter USN: ").
usn = scom next Line ();
public void getMarks ()
for lint i=0; i< 8; i++)
System-out print lu ("Enter Subject to "+ (i+1)+"
Sub[i]- Subjectmarks = seam-nextInt(); marks: ";
System.out. printle ("Enter Subject "+ (i+i) 4 "culits:"
sub[i]. Credits = scan. next Int();
if (sub-[i]. subject marks == 100)
Sub [i]. grade = 10;
else if (Sub [:]. Subject marks (40)
sub[i] . grade =0;
sub[i]. grade = (sub[i]. subject marks/10)+1;
public void compute SGPA ()
 int sumc = 0;
double prod = 0;
for (int i=0;ic's;i++)
```

```
sumc = sumc + sub[i]·credits;
prod = prod + (sub[i]·grade x sub[i]·credits).
 sgpa=prod/sumc;
public class SGPT Sgpa
 Public static void main (String args [])
  Student SI= new Student ();
  S1. get Student Details ();
  SI-get Marks ();
  SIO or compute SOPA ();
 System. out. printle ("Name: "+ 31. name);
 System.out. println ("USN:" + SI- usn)-
System - out. printly ("S.No It Subject Marks It Credits
                          It brade ");
 for (int i=0; i<8; i++)
    System. out . perintly ((i+1)+"1+"+51. Sub[i]. Subject
                          marks +" It" + SI-Sub[i]. oredits
                           + " \ t" + s1. sul-[i]. grade);
  System. out. perint lu ("SGPA =" + S 1- grade);
System. out. print lu (" - - - - - -
```

```
Output:
Enter name:
Incha
Enter USN:
                                Handa in Toleran
BM22CS283
Enter Subject 1 Marks:
Enter Subject 1 Chedits:
Enter Subject 2 Marks:
Enter Subject 2 Credits:
                                    11274 1 12 ..
Enter Subject 3 Marks:
Enter Subject 3 Credits:
Enter Subject 4 Marks:
Enter Subject 4 audits:
                                           o I 🦓 i y ...
Enter Subject 5 marks:
89
Enter Subject 5 credits:
```

ystem.out. perintly ("Sucha N Shastri - 1BM22CS283").

Enter Subject 6 Marks: 97 Enter Subject 6 credits: 3 Enter Subject 7 Marks: Enter Subject 7 credits: Enter Subject 8 Marks: Enter Subject 8 Credits:

1

Name: Sneha

USN: 1 BM 22CS 283

	5.5	,			13 7
¥):	S.No	Subject Marks	Credits	Grade	
	1	90	4	10	Barry S
N	2	97	4	0.	
	3	87	3	- 4	
	4	8 8	3	9	
	5	89	3	Q	
	6	97	3	lo	
	7	90	1	10	
	8	95	1	10	j -
	3600	1= 9.5909			_

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and the street of

Sneha N Shastri - 1BM 22CS 283

```
3-26-12-2023
                                   PA 20-12-23
Book class-object program
 import java-util. Scanner;
 class Books
 string name;
 String author;
  int price;
  int num Pages;
  Books (String name, String author, int price, int hum Pages)
    this name = name;
    this author= author;
    this price = price;
   this. num Pages = num Pages;
  public String to String()
  String names, author, price, num Pages;
   Name: "Book name: "+ this name + "\n";
  author= " Author name: "+ this . author+ "\n";
   price = "Price:"+ this . price + "In";
  numPages = "Number of pages: "+ this numPages + " \11";
  Yeturn name+ author+ price + numbages;
```

```
Class Main
 public static void main (String args [])
 Scanner Scan= new Scanner (System.in);
 int n price, numPages;
 String name, author; <- System. out. printly ("Enks no. of books: (n").
 price = Scan. nentint ();
 hum lages = Scan. Lent Int ();
 name = Stan. next ()
 author = Scan next
Books b[]= new Books [n]
to System out printly (
for (int i = 0; i < n; i++)
 System . out . printly ("Bookness details of Book "+(i+";")
 System. out. println ("Exter name of book: ").
cuthor= scan next time ();
                             - System-Out. printly ("Enter author rame:");
price = scan-hent Line();
 System. out. println (" Enter price of book: ").
 price = Scan. next Int();
System. out. printle ("Enter no. of pages: ");
numpages = S can nentInt();
b[i] = new Books (name, author, price, numPages);
```

( Develop a java program to create an abstract class named Shape that contains 2 integers and an empty method named printhrea (). Provide & clare hamed Rectangle, Triangle and Civile such that each one of the classes extends the class shape. Each of the classes contain only method printfrea() that prints area of the given shape. [Date: 2/1/29 import java.util. Scanner; class input Scanner Scanner Scan; () Scan = new Scanner (System.in); abstract class Shape extends InputScanner double a; double b; abestract void get Input (); abstract void & print Area ( ); class Rectangle extends Shape void get Input ()

```
Mulsaner is = new Input Scanner ();
System out printly (" Enter value of a: ");
new Double ();
system. out, printly (" Enter value of 6:");
be scan. next Double ();
void print Area ()
 double area = a x b;
System. out. printle ("The area of rectough is: "+ area);
class Triangle entends Shape
 void getInput()
   Input is = new Desput Scanner ();
   System. out. printly (" Enter value of a & (base): ").
   a = Sean. nent Bouble ();
  System. out. printle ("Enter value of 6 (height):")
   b=Sean-rent Double ();
                                           e population
                                           ie wer i .
  void print leval)
                                          L. Burgara
  System.out. printlu ("The area of triangle is: "+ area
```

```
class Circle extends Shape
   double s;
   void gulaper ()
    InputScanner is = new InputScanner ();
   System out puintly ("Enter the value of radius: ").
   Y=Scan. next Double ();
  Void printArea ()
  System. out. printly (" The area of circle is: "+ area).
class Main Shape
  · public static void main (String args []) {
 Rectangle v = new Rectangle ();
 Triangle t= new Triangle();
 Circle ( = new Circle();
 Y. get Input ();
 V. print drea ();
 t.guinput();
 t. print Area ();
C. ger Input ();
c. pennt Drea (); } q
```

output: output : Enter value & b; que alle d'albare): Enter value of blbase); The area of triangle is: 24-0 Enter value of radius: The area of circle is 28,2599999

@ Lab 5 - 69 loy 12024

Develop a Jowa program to create class Bond Acount short maintains two kinds of account for its customers one saving and other current account.

Savings account provides - compound Interest & withdraws facilities. No cheque book facility

Current account provides - cheque book faicility but no interest. Service charge imposs ef balance falls below minimus balance.

Create a class Account that stores unstomer harme, acc no, type of acc. From this derive classes curr-Act and Sav-Acct. Include methods to achieve:

a. Accept deposit from customer and cypdate balance b. Display balance

C-Compute & deposit interest

d. Permit withdrawal and update balance

impost java-util. Scanner; class Bank Account

String chame; long accrus; String type; Account (Strin

Account (String on, long ac, String +)

chame = cn; archo = ac; type = E;

```
import javarutil. Scanner;
class Curr Act extends Account -
 jable balance;
  Currect ( String on, long ac, String + 1, double b)
   super (cn, ac, t);
   balance = b;
 public void operations ()
  Scanner scan=new Scanner ( System -in);
  System-out-pointly ("Enter name: ");
  String sescononesettine ();
                               account number: ");
  System - out - perintle ("Enter
  long n = Scan nextlong();
  System. out. perintly ("
  System. out. printly ("Enter choice:");
  System. out. perint lu ("1. Accor Deposit");
 System. out. printle ("2. Display balance");
 System. out. perint by (" 8. Withdrawal");
 System.out. println ("4. Exit");
 C= Scan. next Dut ();
 Switch (c)
   System. out paintle ("Enter deposit amount:");
```

```
double deposit = Scan. reset Double ();
 balance + = deposit;
 break;
 Case 2:
 System-out-point he ("Balance is: "+ balance).
 break;
 Case 3:
 System. out perintles ("total wi
 if balance ( 100)
 E System. out-paintly (
                           Less than minimum balance.
                          Fine of Rs. 5 ");
   balance -= 5;
 else
   System : out - pointly ("Enter withdrawal amount:").
   double ant = scan. next Double ();
  balance -= and;
  System-out. paintly (" Withdrawal Successful. Current
                        Balance = " + balance);
 ereak;
care 4:
 System. out. printle ("Thank You.");
 break;
default:
 System-out-point In (" Invalid choice - ");
3 5 while (c)=4); 3
```

```
less SavAcct escends Account
double balance,
for sect (String co, long ac, String t, double b)
  super (en, ac, t);
public void operations ()
 Sommer Scan = new Scanner ( System - in)
   System . out . pecintle ("1. Deposit. ");
  System. out-peinth ("2. Withdraw-");
  System · Out. println ("3. Compute & deposit interest.");
  System. out. printle (" 4. Display balance").
  System. out. printle ("5. Exit. ");
                     the second the second
  Switch (c)
   System. out. printly ("Enter deposit amount:");
    double deposit = Scan. rest Double ();
    balance + = deposit;
    break;
  Case 2:
   il (balance < 100)
     System. out. priville
                           Fine of Rs. 5 ");
```

```
balance - = 5;
 else
   System " out , printly (" Enter withdrawal amont: "
    double and = scan. hent Double ()
    balance - = amt;
    System-out-paintly (and + "has " withdrawal
                         successful. Balance = " + balance)
 Bbreak;
 Case 3:
  & double r= 6.0/100-0;
   System. out. printle ("Enter duration of account
                         holding ");
  d int t=scan.nextInt();
   double interest = balance * Math. pow((1+2), t)-
                    balance;
   balance = balance + interest;
   System . out. print ln ("Batan Interest: "+ interest);
   System. out. println ("Balance: " + balance);
  beread;
 Case 4:
   System-out-paintly ("Balance: "+ balance);
  break;
 Case 5:
   System. out. println (" towalid choice ");
   bereak;
default:
```

```
your out puntly ( Invalid choice . ");
while (c) = 5);
just main
 public static void main (string args [])
  Scanner Scan = new Scanner (System - in);
  System. out. perint lu ("Enter name:");
  young s=scansnext Line();
  System-out-printly ("Enter account number: ");
  long ac = scan-nentlong();
  System, out. printly ("Enter account type: Savings/
  String t = Scano next Line ();
 System. out = perint lu ("
  System. out. printly (" Details: ");
  System - out printle ("Noune:"+5 =+" \n"
                        Acc No: "+ ac+ "\"+
  Systes
                       Acc Type: "+t);
  4 ( t. equals Ignore (ase ("Savings"))
     Sau Acck sv=new Sau Acet ( shac, t,
 L'System. out. peutle ("Enter a ceaut balance:");
   double b = s can o next Double ();
 of (+ equals ignore (ase ( "Sourings ")))
```

```
SauAcct sv= new SauAcct (S,ac,t,b);

sv.operations();

else if (t.equals | gynore (ase ("Current"))

{
    Curr Net ct = new CurrAct (S,ac,t,b);
    ct.operations();

}
```

```
6-Strings
Infort giava. util. Scarner;
lass String Demo 2
public étatic void noin (Aring args[])
System out printles ("Bmsce equals Bmsce = "+
                              ("Brusce". equals ("Brusce")).
System-out- printly ("Brusce equals College = "+
                               ("Brusce", equals ("College");
Gystem. Out - printly ("Brisce equals Brisce="+
                                ("Brusce". equals ("BMSCE")).
 String SI= 4 Brusce college ".
String S2= 4 Welcome to Brusce College of Engineering ";
il (s1. region matches (0,52,0,13))
System out. print ly ("substring marched").
 System-out-printly (" Not matched");
 System. cout - println ("starts With () domo: ");
 Eystem. out-print In ("Does eclipse stow with
                        ecl? "+ ("edipse". sterrs with ("ed")).
 System out = perintln (" Does eclipse start with ("1+c")).
```

```
System out printh ("endswith () duno: ").
  Systam. out. printly ("Does eclipse end with
                       pse & : " + ("eclipse" endswife
System. out. printle ("Does eclipse end with ecl?)
+ ("eclipse". ends with ("ecl"));
  System. out. printly ("equals versus == ").
 String o = "Brantiful".
 String P= "Beautiful"
 System. out. println ("String 1: "+0)
System. out : printly (4 String 2:4+p).
System. out. println (" Equals: "+ (o. equals (p)).
System. out . printly ("=="+ (0==p)).
                  Output:
Brusce equals
                 Bursce = teme
Brusce equals
                 College = false
Bonse equale
                 BMSCE = false
Not matched.
```

```
facts with demo();
poet eclipse start with eclor time
colips and with lec? false
shith demo():
   eclipse start and with pre ?: true
poil eclipse and with ecl ? : false
ignals versus = =
thing 1. Beautiful
my 2: Beautiful
Equals : true
-= true
totag
Metract class Fly
nethods fly (), makesound ()
Subclasses - Eagle, Hawk
edutact class # by
  public abstract void fly ();
  jublic abstract void makesound ();
class Ecigle extends Fly
  public void fly ()
   Eystem. out : peintly ("The eagle flies high.");
```

public void makesound () System. out. printle ("The eagle emits a high pitched sound"). class Hawk entends Fly public void thy () System. out . printh ("The back flies lower"). public void makesound () System. out. perint lu ("The hank screeches keaaur"). class Bisdman public static void main (string args []) System : out . printh (" Invoking eagle!"): Eagle eg= new tagle (); eg. fly () eg. nakosound ()

```
your out sprintly ( Invoking have !")-
park he = how Hawk ();
1/2 Ply ( );
12. makeround ();
moking eagle 1
The eagle flies high
The eagle emits a high pitched whistle.
Invoking hawk!
The house flies lower
The hands screeches keaper
21. & Implementation of stack wing Generics:
 public class Stack (E>
   E stck [];
  in top;
  find int SIZE = 10;
  Stack ()
   Stek = (E[]) new Object [SIZE];
```

```
void push (E itam)
   if (top = = SIZE-1)
   System-out- printle ("stack is full ");
   Stor [+ + top] = item;
  il (top (0)
     System, out . printly ("Stack underflow").
     return rull;
       java o util · Scannes;
      class Test Stack
  public static void main (string args [7)
```

```
Jul (Integer > mystack 1 = new Stack
gack ( Integer > ( );
jack ( Double > my Stack 2 = new Stack < Double > ( );
James S= new Scanner (System. in);
System out print In ("Enter elements into Integer stack:")
(in i=0; i25; i++)
 int n=s. neut Int();
  mystercle 1. push (n);
System out sprintly ("Enter elements into the double
                  Stack: 4);
 for(int i=0;1<5;i++)
   double m= S=nent Double ()-
  mystack 2. push (m);
 System out . puntly ("Flements of stack 1");
for (in i=0; i<5; i++)
    System o out printly (mystack I - pop()).
 for int r.
 System . out. printly ("Flements of stack 2")-
 for (int i=0; i < 5; i++)
```

out. primtle ( P'nystack pop ()) Output: Enter elements into the integer stack: 12345 Enter elements into the double stack. 8-0 9.0 10.5 11.6 12-7 Elements of stack 1: Elements of stack 2: 12.7 11.6 10.5 9.0 0,8

1-23-01-2024 uchange Packarge CIE -> Classes >> Student Package SEE - External Create the above Packages and classes to implement parkage concept package (1E) provi java-util-Scanner; webs class Student string wsn; String name; int sem; public void input Student Details () Scanner scan = new Scanner (System.in); System. out. println ("Enter name: "); hame = sign. hent (); System out perintln ("Enter usn:"); lusy = scan neut (); System . out. perintly ("Enter sem: "); sem = s can . nout Int (); Public void display Student Details() System.out. perintly ("Name: "+ name); System.out. perintly ("USN; "+ wm);

```
Lysten-out-printh("Semi"+ sem);
package cit;
import dava util Scanner;
public class Internals extends Student
& protected
 , Int marks [] = new int [5];
  public void input (1E Marks ()
     Scanner Scan = new Scanner (System. in);
     System out printly (" Enter internal marks of
                         5 subjects: 4);
    for (int i=0; icmarks-length; i++)
package SEE;
Propert & CIE- Internals;
import java. util-Scanner;
public down External cuteride
   protected int marks[];
```

```
retacked in final Marks [];
elle External ()
 marks = now int [5-];
 finalmarks = new int [5];
 ullic void input SEE Morks ()
Scanner 5 = now Scanner (System. in);
forlint (=0; i<5; i++)
  System out printly (" Subject "+ (i+1)+" marks: ").
 marks [i] = s and next Int ();
public void calculate Final Marks ()
 forline (=o;ixs;i++)
  fornal Marks [i] = marks [i]/2 + super-marks [j.
public void display Final Marks ()
  display student Details ();
  tor (int 1:0; I < 5; i++)
   System, out printly ("subject "+ (i+1)+":
                                 final Marks [i])
```

```
import SEE. External;
class Main Marks
  public static void man (string args [])
       in numofsudents = 2;
       External finalphourks[] = new External [ num of Judenti].
      tor(int 1=0; i < num Of students; i++)
         finalmarks [ ; ]= new External ();
         Ginal Marks [ ; J. input Student Details ();
          Septem. out . printtn ("Enter CIE marks ");
          Linoulmorks[i], input(IE Morals(),
         System-out-printer ("Enter SEF Marks").
         Final Marks [: ]. input SET Marks ();
       System - out - printly (" Displaying data: 14");
      for (int i=0; i < numal students: i++)
        final Marks [i] - colculate Final Marks ()-
       final Marks [i] - display Final Marks ();
```

```
Parput:
Inches
gur ush:
1BM 22 CS 283
Enter sem:
Enter CIE marks
file internal marks of 5 subjects:
49
Enter SEE marks
Subject 1 marks: 99
abject 2 marks: 98
         marks: 90
Subject 3
Subject 4 marks: 95
subject 5 marks: 96
Enter name:
Siri
Enter ush:
18m22C5280
Enter sem:
Enter CIE marks
      internal marks of 5 subjects:
```

45 47 49

Enter SEE marks

Subject 1 marks: 90

Subject 2 marks: 99

Sulyect 3 marks: 8

Sulgiect 4 marks: 98

Subject 5 mayber: 90

Displaying data:

Name: Sucha

USN: 18M22 CS283

Sem: 3

Subject 1:99

Subject 2:98

0 1

Suleject 3:93

Sulgiect 4:94

Subject 5:94

Name: Sivi

USN: 1BM 22CS 280

Sem: 3

Suly oct 1:95

Subject 2: 94

Subject 3:50

Subject 4:96

C. Work C:94

30/1/24

30/1/12024 10 program that demonstrates handling of exception Inheritance tree Create a base class called Father and derived class called 'Son' which extends the dass . In Father class, implement a constructor bush takes the age of and the said to which takes the age of and throws the exception (Drong Age () when the input age 20 = In Son class, implement a constructor that cases both father and gon's age and throws an exception if son's age > father's age class Wrong Age extends Exception Wrong Age (String s) 2 super (s); import java-util. Scanner. class Father int age; Scanner scan= new Scanner (System.in); Father () throws Wrong Age bystem. out. printly ("Enter Father's age :"). age = scom. neur Int (); Mage < 0) throw new wrongAge ("Age council be negative.");

```
import dava-util-Scanner;
class son ordereds Father
Int sonage;
                            Scanner (system in);
  Scenner Scan = new
  Son (1 throws Wrong Age
   of (sonage rage)
    throw numberong Age (" son's age cannot be greate thom lather's age. ");
 public void display()
    System. out. pri will "Father's age: "+ cige);
    Sepstem-out-printle ("son's age: " + songe)
    System. out. printlu ("Sneha N Shastri- 1BM22(528)
class Age Main
 public static void main (String args[]) throws Exception
   Son s= new Son ();
```

we chely lightay (), Inter father's age: Enter son's age: in thread "main" Wrong Age: Son's age cannot & greater than father's age. Enter father's age: Exception in thread " main" Wrong Age: Age cannot be into father's age. Enter son's age: in thread "main" Wronglage. Age cannot Enter father's agr. luter 80n's Father's age:50 Jun's age: 20 N Shastri - 1BM 22CS 283

```
6/2/124
8) Write a program which creates two threads, one diplos
  "Brus coulege of Engineering" once every ten seconds
  and another displaying "CSE" once every two second
  class New Thread implements Runnable
    Thread to
    New Twead ()
      t = new Thread (this, "NThread");
      System. out. printly ("CT:"+ t);
     t. start ();
   polic void vun ()
       for (int n=5; n>0; n--)
         System.out. printly ("CSE").
Thread. sleep ($2000).
    Cotch (Enterrupted Exception ie)
```

fisher out printed ("Ese Thread Interrupted"); system. out-printly ("CSE thread quitting"). lass Thread 2 public static void main (String args [7) new NewTherand (); System-out. puntly ("Back in Men"); furlint n=5;n>0;n--) System. out. print la ( "BMS collège of lings reing") Trougal . sleep (10000); catch (Interrupted Enaption ie) System. out, print la ("BMS three act interrupted"). System. out. printly (" BMS threead quitting "). System. out. printle ("Snels N Shartri-113 m 22 CS 283).

Output: (T: Thread [# 29, NThoread, 5, main] Back in main BMS College of lengineering CSE CSE CSE CSE CSE BMS College of lengineering CSE thread quitting BMS College of langineering Bons College of Engineering Bus allege of Engineering Bus thread quitting Sneha N Sheistri-18422CS283 

```
Inter process Communication
                                         and deadlock
Well Process Communication
ins
 boolean vælue let = false;
 synchronized int get()
   while (! value Set)
    ferel
     System. olt. printly ("consumer waiting").
     wait ()
     y catch (Interrupted Exception e).
     system. ow. printly ("Interrupted Exception caught").
   System. out. printle ("Crot;
   valueSet = fulse;
   System. out. printle ("Intimate Produces").
   hotify ();
   return h;
                         put (:nt n)
                 Moid
    while (value let)
```

System. out. printly ("Produces waiting"); 8 ystem out printly ( this . n = n; Value Set = tene; Eystem. out . println ("Put: "+ n); System. out. per ntlul " Intimate Consumer". 11 Producer class class Producer implements Runnable Qq; Producer (Q q) this . q = 95 read (this, "Producer"). start (); puldic void rum ()

```
implements
                        mes 4) - start ();
            (this, "Comm
public void run ()
 12 Fo;
 while (ic= 5)
 System. out sprint lu ("consumed; "+ ");
```

class PCFixed public static void main (String args []) Q q= New Q(); rus Producer (9); hew Consumer (q); System. out . prither ("Press Control - ( to stop. "). System. out. printly ( Sucha N Sharti - 18M22CS20) Output: Press Control -c to stop. Sucha N Sharty - 18M22CS 283 Put: 0 Intimate Consumer Produces waiting Gret: 0 Intimate Producer Put = 1 Intimate Conjune Proclucer was ting consumed: 0 Got: 1

Wind Producer Consumed: 1 Put: 2 intimate Consumer Produces waiting Got = 2 Intimete Producer Consumed = 2 Pus : 3 Indinate Consumer Producer waiting Crot: 3 Intimate Producer Consumed; 3 But: 4 Intimate Consumer Producer waiting Crot: 4 Intimate Produces Consumed : 4 Put:5 lationate Consumer Gut . 5 Intimate Producer Consumed

5. Diadiak clear A Synchronized void too (B 5) name = Thread-airent Thread (). gu entered A. foor). Eystem-out printly ( or home + " Thread. sleep (1000); I catch (Exception e) & System. our printe ("A werrysted"). System. out. print lu (name + " trying to call B (ax-()"); b. last () void lest ()

synchronized void boy (A a) name = Thread . averent Thread () . get Name (), System. out. printly ( name + "entered B. bar"). gread . sleep (1000); witch (Exception e) System. out. printle ("B interrupted"). System. out. printly (name + " trying to call A. last ()"). a. last (); void last () System. out. println (" wride A. (oust 4) des Diadlock implements Runnabble A a = new ACX Bb=new B(); Peadlock ()

Thread. current Thread(). setName (" Main Thready) Thread t = new Thread (this, " Racing Thread "). t. start(): a. 600 (b) System. out. printle ("Back in man thready). public void run() b. bar (a); System. out. printle ("Back in other thread").
3 - System. out. printle ("Sucha N Sharki-18m22C5283") public static Soid main (String aggs [3) nen Deadlock(); Output: Back in other Racing Thread entered B. bar thread mainThread entered a foo Lieba N Sherti trainthread trying to call -1BM22CJ283 Ihride A. Leist Back in main threat RacingTheread trying to call A. last () Inside A. last 13.02.24

Applets 2029 impost javax swing . \*;
impost java aut . \*;
impost java aut . \*; ing para aut. évent. \*; class Guring Dermo Swing Demo () Iframe of from = new Iframe ("Divider App"). itam- set & Sr (512,500). jfrm- Sethayout ( New Flow Layout ()); jfem. Set Default Close Operation (JFrame - EXIT-ON-CLOSE). Jeabel glab=new Jlabel ("Enter the derividence and JTent Field of agtf=now JTentfield (8). divisor 4). Trentfield byth = new JTentfield (8); JButton button = new J Button (" calculate"). Thatel ever= new Jealel(); Thatel alout show Thubel(). Jabel block = new Jlabel(). Jabel anslab = new Jlabel ). item. add (j lab). often, add (ay +f). ofen add Chitts oten. add (button); n sylving the Ta

```
item add (ever);
 of frm. add (alab);
 of fim - add (blab).
d frm. add (anslow).
button. add Action Listener (new Action Listener () 5
public void action Performed (Action Event evt)
     int a = Integer. parse (ajt f. get Text ()).
     int b = Integer. parse ( b) + f. get Text ()).
     4 (6==0)
       Throws new Arithmetic Exception ( " B should be
   int ans = a/b;
  alabo setText (4 in Dividend (A) = 4+ a)-
  black, set Text (" In Divisor (B) = "+ b).
  anstal, set Text (" (n Result = "+ ans);
  our . Set Tent (4 4).
 I catch (Number Format Exception e)
    about settent (" Fiter only integers!");
```

plate ser and place set Tent (" 11); Intel (Drithmetic Exception e) ors, set Tent ("B should be non alab, set Tent (" "); blab. set Tent (" "); oursland. set Tent (" "); tilities. invoke Later (new Runnable () public vojd run ()

Output.

inter the	dividend and divisor
10	5
Catantato	Dividend (A)=10

Functions used:

- 1 void set Size lint width, int height) Sets the size of the component.
- 2. Void Sethayout (Layouthanager mays) Sets the layout manager for the JF same.
- 3. Void set Default Close Operation (int operation) Sets default close operation for the JEranne.
- 4 void add Action Listener (ActionListener listener) Adds an action listener to the Brutlon
- 5. Voi'd settent (String tent): Sets the tent of a I label or a J Tent Field.
- 6. void invokehater (Runnable dokun): Causes the Runnilly to be executed curynchronously on the AWT event disparching thread.
- 7. 8 set Visible (boolean visible): Sets the visibility of

soid ran () - Method executed by Runnable forterface which in this case initializes the guing Demo Object.

20/2/24

### 1. Quadratic Equation

```
import java.util.Scanner;
class Quadratic{
public void compute(int a,int b,int c)
Scanner scan=new Scanner(System.in);
while(a==0)
System.out.println("Enter a non zero value of a:");
a=scan.nextInt();
int d=b*b-4*a*c;
double r1=0.0, r2=0.0;
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("Root2 = "+r1+"-i"+r2);
public static void main(String args[]){
Scanner scan=new Scanner(System.in);
int a,b,c;
System.out.println("Enter the co-efficients of a,b and c of a quadratic equation:");
a=scan.nextInt();
b=scan.nextInt();
c=scan.nextInt();
Quadratic q=new Quadratic();
q.compute(a,b,c);
System.out.println("-----");
System.out.println("Sneha N Shastri - 1BM22CS283");
}}
```

#### 2. SGPA Calculation

```
public class Subject
int subjectmarks;
int credits;
int grade;
import java.util.Scanner;
public class Student
Subject sub[];
String name;
String usn;
double sgpa;
Scanner scan=new Scanner(System.in);
Student()
sub = new Subject[8];
for(int i=0; i<8; i++)
sub[i] = new Subject();
scan = new Scanner(System.in);
public void getStudentDetails()
System.out.println("Enter name:");
name=scan.nextLine();
System.out.println("Enter USN:");
usn=scan.nextLine();
public void getMarks()
for(int i=0; i<8; i++)
System.out.println("Enter Subject "+(i+1)+" marks:");
sub[i].subjectmarks=scan.nextInt();
System.out.println("Enter Subject "+(i+1)+" credits:");
sub[i].credits=scan.nextInt();
if(sub[i].subjectmarks==100)
sub[i].grade=10;
else if(sub[i].subjectmarks<40)
sub[i].grade=0;
sub[i].grade=(sub[i].subjectmarks/10)+1;
}
}
public void computeSGPA()
```

```
{
int sumc=0;
double prod=0;
for(int i=0;i<8;i++)
sumc=sumc+sub[i].credits;
prod=prod+(sub[i].grade*sub[i].credits);
sgpa=prod/sumc;
public class Sgpa
public static void main(String args[])
Student s1=new Student();
s1.getStudentDetails();
s1.getMarks();
s1.computeSGPA();
System.out.println("Name:"+s1.name);
System.out.println("USN:"+s1.usn);
System.out.println("S.no\tSubject Marks\tCredits\tGrade");
for(int i=0; i<8; i++)
System.out.println((i+1)+"\t"+s1.sub[i].subjectmarks+"\t"+s1.sub[i].credits+"\t"+s1.sub[i].gr
ade);
System.out.println("SGPA="+s1.sgpa);
System.out.println("----");
System.out.println("Sneha N Shastri - 1BM22CS283");
```

## 3. Book Class Object Program

```
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;
}
import java.util.Scanner;
class Main
public static void main(String args[])
Scanner scan=new Scanner(System.in);
int n,price,numPages;
String name, author;
System.out.println("Enter no.of books:\n");
n=scan.nextInt();
Books b[]=new Books[n];
for(int i=0;i< n;i++)
System.out.println("Enter details of the book"+(i+1)+":");
System.out.println("Enter name of book:");
name=scan.next();
System.out.println("Enter author name:");
author=scan.next();
System.out.println("Enter price of book:");
price=scan.nextInt();
System.out.println("Enter no.of pages:");
numPages=scan.nextInt();
b[i]=new Books(name,author,price,numPages);
```

```
}
System.out.println("Book Details:");
System.out.println("Book Name\tAuthor\tPrice\tNo.of Pages");
for(int i=0;i<n;i++)
{
System.out.println(b[i].name+"\t"+b[i].author+"\t"+b[i].price+"\t"+b[i].numPages);
}
System.out.println("Sneha N Shastri - 1BM22CS283");
}
</pre>
```

```
4. Abstract Class - Shape
import java.util.Scanner;
class InputScanner
Scanner scan;
InputScanner()
scan=new Scanner(System.in);
abstract class Shape extends InputScanner
double a:
double b:
abstract void getInput();
abstract void printArea();
class Rectangle extends Shape
void getInput()
InputScanner is=new InputScanner();
System.out.println("Enter value of a:");
a=scan.nextDouble();
System.out.println("Enter value of b:");
b=scan.nextDouble();
void printArea()
double area=a*b;
System.out.println("The area of rectangle is:"+area);
class Triangle extends Shape
void getInput()
InputScanner is=new InputScanner();
System.out.println("Enter value of a(base):");
a=scan.nextDouble();
System.out.println("Enter value of b(base):");
b=scan.nextDouble();
void printArea()
double area=0.5*a*b;
```

```
System.out.println("The area of triangle is:"+area);
class Circle extends Shape
double r:
void getInput()
InputScanner is=new InputScanner();
System.out.println("Enter value of radius:");
r=scan.nextDouble();
void printArea()
double area=3.14*r*r;
System.out.println("The area of circle is:"+area);
class MainShape
public static void main(String args[])
Rectangle r=new Rectangle();
Triangle t=new Triangle();
Circle c=new Circle();
r.getInput();
r.printArea();
t.getInput();
t.printArea();
c.getInput();
c.printArea();
System.out.println("Sneha N Shastri-----1BM22CS283");
```

#### 5. Bank Account

```
//Account
import java.util.Scanner;
class Account
String cname;
long accno;
String type;
Account(String cn,long ac,String t)
cname=cn;
accno=ac;
type=t;
//Account class
import java.util.Scanner;
class MainAccount
public static void main(String args[])
Scanner scan=new Scanner(System.in);
System.out.println("Enter Name:");
String s=scan.nextLine();
System.out.println("Enter Account Number:");
long ac=scan.nextLong();
System.out.println("Enter account type:Savings/Current");
String t=scan.next();
System.out.println("Enter account balance:");
double b=scan.nextDouble();
System.out.println("-----");
System.out.println("Details:");
System.out.println("Name:"+s);
System.out.println("Acc No:"+ac);
System.out.println("Acc Type:"+t);
System.out.println("Acc Type:"+t);
System.out.println("-----");
if(t.equalsIgnoreCase("Savings"))
SavAcct sv=new SavAcct(s,ac,t,b);
sv.operations();
else if(t.equalsIgnoreCase("Current"))
CurrAct ct=new CurrAct(s,ac,t,b);
ct.operations();
,
System.out.println("-----");
```

```
System.out.println("Sneha N Shastri - 1BM22CS283");
//Savings Account Class
import java.util.Scanner;
class SavAcct extends Account
double balance;
SavAcct(String cn,long ac,String t,double b)
super(cn,ac,t);
balance=b;
public void operations()
Scanner scan=new Scanner(System.in);
int c:
do
System.out.println("Enter choice:");
System.out.println("1.Deposit");
System.out.println("2.Withdraw");
System.out.println("3.Compute and Deposit interest.");
System.out.println("4.Display Balance");
System.out.println("5.Exit");
c=scan.nextInt();
switch(c)
case 1:
System.out.println("Enter deposit amount:");
double deposit=scan.nextDouble();
balance+=deposit;
break;
case 2:
if(balance<100)
System.out.println("Less than minimum balance. Fine of Rs.5");
balance-=5;
}
else
System.out.println("Enter withdrawal amount:");
double amt=scan.nextDouble();
balance-=amt;
System.out.println("Withdrawal successful. Current balance="+balance);
break;
case 3:
```

```
double r=6.0/100.0;
System.out.println("Enter duration of account holding:");
int t=scan.nextInt();
double interest=balance*Math.pow((1+r),t)-balance;
balance+=interest;
System.out.println("Interest="+interest);
System.out.println("Balance="+balance);
break:
case 4:
System.out.println("Balance is:"+balance);
break;
case 5:
System.out.println("Thank You.");
break:
default:
System.out.println("Invalid Choice.");
\}while(c!=5);
//Current Account
import java.util.Scanner;
class CurrAct extends Account
double balance:
CurrAct(String cn,long ac,String t,double b)
super(cn,ac,t);
balance=b;
public void operations()
Scanner scan=new Scanner(System.in);
int c;
do
System.out.println("Enter choice:");
System.out.println("1.Deposit");
System.out.println("2.Display Balance");
System.out.println("3.Withdraw");
System.out.println("4.Exit");
c=scan.nextInt();
switch(c)
case 1:
System.out.println("Enter deposit amount:");
double deposit=scan.nextDouble();
balance+=deposit;
break;
```

```
case 2:
System.out.println("Balance is:"+balance);
break;
case 3:
if(balance<100)
System.out.println("Less than minimum balance. Fine of Rs.5");
balance=5;
else
System.out.println("Enter withdrawal amount:");
double amt=scan.nextDouble();
balance-=amt;
System.out.println("Withdrawal successful. Current balance="+balance);
break;
case 4:
System.out.println("Thank You.");
break;
default:
System.out.println("Invalid Choice.");
}while(c!=4);
```

```
6. Package Program – CIE, SEE
//Sneha N Shastri - 1BM22CS283
//Student Class
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 scan=new Scanner(System.in);
System.out.println("Enter name:");
name=scan.next();
System.out.println("Enter usn:");
usn=scan.next();
System.out.println("Enter sem:");
sem=scan.nextInt();
public void displayStudentDetails() {
System.out.println("Name:"+name);
System.out.println("USN:"+usn);
System.out.println("Sem:"+sem);
//Internals class
package CIE;
import java.util.Scanner;
public class Internals extends Student
protected int marks[] = new int[5];
public void inputCIEmarks()
Scanner scan=new Scanner(System.in);
System.out.println("Enter internal marks of 5 subjects:");
for(int i=0;i<marks.length;i++)
marks[i]=scan.nextInt();
//External class
package SEE;
import CIE.Internals;
```

import java.util.Scanner;

```
public class External extends Internals {
protected int marks[];
protected int finalMarks[];
public External() {
marks = new int[5];
finalMarks = new int[5];
public void inputSEEmarks() {
Scanner s = new Scanner(System.in);
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]);
}
//MainMarks
import SEE.External;
class MainMarks
public static void main(String args[])
int numOfStudents = 2;
External finalMarks[] = new External[numOfStudents];
for(int i=0;i<numOfStudents;i++)
finalMarks[i] = new External();
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++)
```

finalMarke[i] calculataFinalMarke()
finalMarks[i].calculateFinalMarks(); finalMarks[i].displayFinalMarks(); } //end of for loop
finalMarks[1].displayFinalMarks();
} //end of for loop
į ·
\$
}

# 7. Exception Handling - User Defined Exceptions

```
//WrongAge user defined exception class
class WrongAge extends Exception
WrongAge(String s)
super(s);
//Father class
import java.util.Scanner;
class Father
int age;
Scanner scan=new Scanner(System.in);
Father()throws WrongAge
System.out.println("Enter father's age:");
age=scan.nextInt();
if(age<0)
throw new WrongAge("Age cannot be negative.");
}
//Son class
import java.util.Scanner;
class Son extends Father
int sonage;
Scanner scan=new Scanner(System.in);
Son()throws WrongAge
System.out.println("Enter son's age:");
sonage=scan.nextInt();
if(sonage<0)
throw new WrongAge("Age cannot be negative.");
public void check()throws WrongAge
if(sonage>=age)
throw new WrongAge("Son's age cannot be greater than father's age.");
}
public void display()
System.out.println("Father's age: "+age);
```

```
System.out.println("Son's age:"+sonage);
System.out.println("Sneha N Shastri - 1BM22CS283");
}

//AgeMain class
class AgeMain
{
public static void main(String args[])throws Exception
{
Son s=new Son();
s.check();
s.display();
}
}
```

#### 8. Threads

```
class NewThread implements Runnable
Thread t;
NewThread()
t=new Thread(this, "NThread");
System.out.println("CT:"+t);
t.start();
public void run()
try
for(int n=5;n>0;n--)
System.out.println("CSE");
Thread.sleep(2000);
catch(InterruptedException ie) {
System.out.println("CSE thread interrupted");
System.out.println("CSE thread quitting");
class Thread2
public static void main(String ss[])
new NewThread();
System.out.println("Back in main");
for(int n=5;n>0;n--)
System.out.println("BMS College of Engineering");
Thread.sleep(10000);
}}
catch(InterruptedException ie)
System.out.println("BMS thread interrupted");
System.out.println("BMS thread quitting.");
System.out.println("Sneha N Shastri ----- 1BM22CS283");
```

```
9. Applets - Usage of SWING and AWT
```

```
import javax.swing.*;
import java.awt.*;
import java.awt.event.*;
class SwingDemo {
SwingDemo() {
// create iframe container
JFrame ifrm = new JFrame("Divider App");
jfrm.setSize(275, 200);
ifrm.setLayout(new FlowLayout());
// to terminate on close
ifrm.setDefaultCloseOperation(JFrame.EXIT ON CLOSE);
// text label
JLabel jlab = new JLabel("Enter the dividend and divisor:");
// add text field for both numbers
JTextField aitf = new JTextField(8);
JTextField bitf = 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 :)
ifrm.add(jlab);
jfrm.add(ajtf);
jfrm.add(bjtf);
jfrm.add(button);
jfrm.add(err);
ifrm.add(alab);
jfrm.add(blab);
ifrm.add(anslab);
button.addActionListener(new ActionListener() {
public void actionPerformed(ActionEvent evt) {
try {
int a = Integer.parseInt(ajtf.getText());
int b = Integer.parseInt(bjtf.getText());
if (b == 0) {
throw new ArithmeticException("B should be non-zero!");
int ans = a / b;
```

```
alab.setText("\nDividend (A) = " + a);
blab.setText("\nDivisor (B) = " + b);
anslab.setText("\nResult = " + ans);
err.setText("");
} catch (NumberFormatException e) {
err.setText("Enter Only Integers!");
alab.setText("");
blab.setText("");
anslab.setText("");
} catch (ArithmeticException e) {
err.setText("B should be non-zero!");
alab.setText("");
blab.setText("");
anslab.setText("");
}
1);
// 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();
});
```

//Sneha N Shastri - 1BM22CS283

#### 10. IPC and Deadlock

```
10. a. IPC
class Q {
int n:
boolean valueSet = false;
synchronized int get() {
while(!valueSet)
System.out.println("Consumer waiting");
wait();
} catch(InterruptedException e) {
System.out.println("InterruptedException caught");
System.out.println("Got: " + n);
valueSet = false;
System.out.println("Intimate Producer");
return n;
synchronized void put(int n) {
while(valueSet)
try {
System.out.println("Producer waiting");
} catch(InterruptedException e) {
System.out.println("InterruptedException caught");
this.n = n;
valueSet = true;
System.out.println("Put: " + n);
System.out.println("Intimate Consumer");
notify();
}
}
//Producer class
class Producer implements Runnable {
Qq;
Producer(Q q) {
this.q = q;
new Thread(this, "Producer").start();
public void run() {
int i = 0;
while(i <=5) {
q.put(i++);
```

```
}
}
//Consumer class
class Consumer implements Runnable {
Consumer(Q q) {
this.q = q;
new Thread(this, "Consumer").start();
public void run() {
int i=0;
while(i <=5) {
int r=q.get();
System.out.println("consumed:"+r);
class PCFixed {
public static void main(String args[]) {
Q q = \text{new } Q();
new Producer(q);
new Consumer(q);
System.out.println("Press Control-C to stop.");
System.out.println("Sneha N Shastri - 1BM22CS283");
10. b. 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 A.last");
class Deadlock implements Runnable
A a = \text{new } A();
B b = new B();
Deadlock() {
Thread.currentThread().setName("MainThread");
Thread t = new Thread(this,
"RacingThread");
t.start();
a.foo(b);
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();
}
```