Malla Reddy College Engineering (Autonomous)

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Department of Information Technology

II B. TECH I SEM (A.Y.2018-19)

80510 - JAVA PROGRAMMING LAB

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: 80510	**JAVA PROGRAMMING LAB**	**L**	**T**	**P**
Credits: 2	**(Common for CSE and IT)**	**-**	**1**	**2**

Prerequisite: NIL Course Objectives:

This course will make students able to learn and understand the concepts and features of object oriented programming and the object oriented concept like inheritance and will know how to make use of interfaces and package, to acquire the knowledge in Java's exception handling mechanism, multithreading, to explore concepts of Applets and event handling mechanism. This course makes students to gain the knowledge in programming using Layout Manager and swings.

Software Requirements: Java

List of Programs:

1. Write Java Programs that implement the following..

a) Constructor
b) Parameterized constructor
c) Method overloading
d) Constructor overloading

2. Write a JAVA program

a) Checks whether a given string is a palindrome or not.
b) For sorting a given list of names in ascending order.
c) That reads a line if integers and then displays each integer and the sum of all integers(use string tokenizer class of java.util).

3. Write JAVA programs that uses the following keywords…

a) This
b) Super
c) Static
d) Final

4. Write a JAVA program to implement

a) Method overloading.
b) Dynamic method dispatch.
c) Multiple inheritance.

d) Access specifiers.

5. Write a JAVA program that
a) Reads a file name from the user, and then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.
b) Reads a file and displays the file on the screen, with a line number before each line.
c) Displays the number of characters, lines and words in a test file.

6. Write a JAVA program for handling
a) Checked exceptions.
b) Unchecked exceptions.

7. Write a JAVA program
a) Creates three threads. First threads displays “Good Morning “for every one Second, the second thread displays “Hello” for every two seconds, the third thread Displays “Welcome” for every three seconds.
b) That correctly implements producer consumer problem using concept of inter thread communication.

8. Develop an Applet that
a) Displays a simple message.
b) Receives an integer in one text field, and computes its factorial value and returns it in another text field , when the button named “ Compute” is clicked.

9. Write a JAVA program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +,-,*,/ operations. Add a text field to display the result.

10. Write a JAVA program for handling
a) Mouse events.
b) Key events.

11. Write a JAVA 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 number format exception. If num2 were zero, the program would throw an arithmetic exception and display the exception in the message dialogue box.

12. Write a JAVA program that

a) Simulates traffic light. The program lets the user select one of three lights: red, yellow or green. When a radio button is selected, the light is turned on and only one light can be on at a time. No light is on when the program starts.

b) Allows the user to draw lines rectangles and ovals.

TEXT BOOKS

1. Herbert Schildt, "**Java The complete reference**", TMH, 7th edition, 2011.
2. T. Budd, "**Understanding OOP with Java**", Pearson Education, updated edition, 1998.

REFERENCES

1. P.J. Deitel and H.M. Deitel, "**Java for Programmers**", Pearson education.
2. P. Radha Krishna, "**Object Oriented Programming through Java**", Universities Press.
3. Bruce Eckel," **Programming in Java**", Pearson Education.
4. S. Malhotra and S. Choudhary," **Programming in Java**", Oxford Univ. Press.

Course Outcomes:

At the end of the course, students will be able to

1. **Build** simple java progras using the basic concepts of OOP
2. **Develop** applications on files, exceptions, threads and applets.
3. **Construct** GUI based applications.

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2	3										3	2	
CO2			3		2								2	3	
CO3		2	2		2									2	
CO4			3		3									2	
CO5		2	2		3								2	2	

LAB OBJECTIVE

1. Ability to learn and understand the concepts and features of object oriented programming and the object oriented concept like inheritance and will know how to make use of interfaces and package.
2. To acquire the knowledge in Java's exception handling mechanism, multithreading, to explore concepts of Applets and event handling mechanism.
3. Ability to explore the concepts like Layout Manager and swings.

INDEX

	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 number format exception. If num2 were zero, the program would throw an arithmetic exception and display the exception in the message dialogue box.	
12	Experiment:12 Write a Java program that a) Simulates traffic light. The program lets the user select one of three lights: red, yellow or green. When a radio button is selected, the light is turned on and only one light can be on at a time. No light is on when the program starts. b) Allows the user to draw lines rectangles and ovals.	49

1: Write Java Programs that implement the following..

a) Constructor

b) Parameterized constructor

c) Method overloading

d) Constructor overloading

a)Constructor is a block of code that initializes the newly created object. A constructor resembles an instance method in java but it's not a method as it doesn't have a return type. In short constructor and method are different(More on this at the end of this guide). People often refer constructor as special type of method in Java.

Program:

```
public class Hello {
  String name;
  //Constructor
  Hello(){
    this.name = "BeginnersBook.com";
  }
  public static void main(String[] args) {
    Hello obj = new Hello();
    System.out.println(obj.name);
  }
}
```

Output:

```
BeginnersBook.com
```

b)

```
class Example{
  //Default constructor
  Example(){
    System.out.println("Default constructor");
  }
  /* Parameterized constructor with
   * two integer arguments
   */
  Example(int i, int j){
```

```
    System.out.println("constructor with Two parameters");
  }
  /* Parameterized constructor with
   * three integer arguments
   */
  Example(int i, int j, int k){
    System.out.println("constructor with Three parameters");
  }

  /* Parameterized constructor with
   * two arguments, int and String
   */
  Example(int i, String name){
    System.out.println("constructor with int and String param");
  }
  public static void main(String args[]){
    //This will invoke default constructor
    Example obj = new Example();

    /* This will invoke the constructor
     * with two int parameters
     */
    Example obj2 = new Example(12, 12);

    /* This will invoke the constructor
     * with three int parameters
     */
    Example obj3 = new Example(1, 2, 13);

    /* This will invoke the constructor
     * with int and String parameters
     */
    Example obj4 = new Example(1,"BeginnersBook");
  }
}
```

Output:

```
Default constructor
constructor with Two parameters
constructor with Three parameters
constructor with int and String param
```

c)

In order to overload a method, the argument lists of the methods must differ in either of these:
1. Number of parameters.
For example: This is a valid case of overloading

```
add(int, int)
add(int, int, int)
```

2. Data type of parameters.
For example:

```
add(int, int)
add(int, float)
```

3. Sequence of Data type of parameters.
For example:

```
add(int, float)
add(float, int)
```

Pgm:

```
class DisplayOverloading
{
   public void disp(char c)
   {
       System.out.println(c);
   }
   public void disp(char c, int num)
   {
       System.out.println(c + " "+num);
   }
}
class Sample
{
  public static void main(String args[])
  {
     DisplayOverloading obj = new DisplayOverloading();
     obj.disp('a');
     obj.disp('a',10);
  }
}
```

```
Output:
a
a 10
```

d) Constructor Overloading:

```
class StudentData
{
  private int stuID;
  private String stuName;
  private int stuAge;
  StudentData()
  {
     //Default constructor
     stuID = 100;
     stuName = "New Student";
     stuAge = 18;
  }
  StudentData(int num1, String str, int num2)
  {
     //Parameterized constructor
     stuID = num1;
     stuName = str;
     stuAge = num2;
  }
  //Getter and setter methods
  public int getStuID() {
     return stuID;
  }
  public void setStuID(int stuID) {
     this.stuID = stuID;
  }
  public String getStuName() {
     return stuName;
  }
  public void setStuName(String stuName) {
     this.stuName = stuName;
  }
  public int getStuAge() {
     return stuAge;
  }
  public void setStuAge(int stuAge) {
     this.stuAge = stuAge;
  }

  public static void main(String args[])
```

```
  {
     //This object creation would call the default constructor
     StudentData myobj = new StudentData();
     System.out.println("Student Name is: "+myobj.getStuName());
     System.out.println("Student Age is: "+myobj.getStuAge());
     System.out.println("Student ID is: "+myobj.getStuID());

     /*This object creation would call the parameterized
      * constructor StudentData(int, String, int)*/
     StudentData myobj2 = new StudentData(555, "Chaitanya", 25);
     System.out.println("Student Name is: "+myobj2.getStuName());
     System.out.println("Student Age is: "+myobj2.getStuAge());
     System.out.println("Student ID is: "+myobj2.getStuID());
  }
}
```

Output:

```
Student Name is: New Student
Student Age is: 18
Student ID is: 100
Student Name is: Chaitanya
Student Age is: 25
Student ID is: 555
```

2. Write a Java program

a) checks whether a given string is a palindrome or not.

b) for sorting a given list of names in ascending order.

c) that reads a line if integers and then displays each integer and the sum of all integers(use string tokenizer class of java.util).

a)

Program:

```
import java.util.Scanner;
class ChkPalindrome { public static void main(String args[])
{
String str, rev = "";
Scanner sc = new Scanner(System.in);
System.out.println("Enter a string:");
str = sc.nextLine();
int length = str.length();
for ( int i = length - 1; i >= 0; i-- )
 rev = rev + str.charAt(i);
if (str.equals(rev))
System.out.println(str+" is a palindrome");
else System.out.println(str+" is not a palindrome"); } }
```

OutPut:

```
Enter a string:
radar
radar is a palindrome
```

b)

```
class sorting
{
        public static void main(String[] input)
        {
                int k=input.length;
                String temp=new String();
                String names[]=new String[k+1];
                for(int i=0;i<k;i++)
                {
                        names[i]=input[i];
                }
                for(int i=0;i<k;i++)
                        for(int j=i+1;j<k;j++)
                        {
                                if(names[i].compareTo(names[j])<0)
                                {
                                        temp=names[i];
                                        names[i]=names[j];
                                        names[j]=temp;
                                }
                        }
System.out.println("Sorted order is");
for(int i=0;i<k;i++)
{
                        System.out.println(names[i]);
}
    }
}
```

OutPut:

Java sorting Harish Ramesh Mahesh Rakesh

Sorted order is

Ramesh

Rakesh

Mahesh

Harish

Java sorting sai hari teja ravi sandeep

Sorted order is

teja

sandeep

sai

ravi

hari

c) That reads a line if integers and then displays each integer and the sum of all integers

```
import java.io.*;
import java.util.Scanner;
import java.util.StringTokenizer;
class StringTokenizerEx
{
   public static void main(String[] args) throws IOException
   {
      BufferedReader br = new BufferedReader(new InputStreamReader(System.in));
      //Scanner objScanner = new Scanner(System.in);
      System.out.print("\nEnter A Line Of Integers:");
      //String line = objScanner.nextLine();
      String line = br.readLine();
      StringTokenizer st = new StringTokenizer(line);
      System.out.println("\nNumber of tokens : "+st.countTokens());
      long sum = 0;
      System.out.print("\nTokens are : \n" );
      while (st.hasMoreTokens())
      {
         long i = Long.parseLong(st.nextToken());
         System.out.print(i + "\n");
         sum = sum + i;
      }
      System.out.println("\nThe Sum Is :" +sum);

   }
}
```

Output:

Enter A line of integers: 1 4 23 2

Number of tokens: 4

Tokens are:

1 4 23 2

The sum is : 30

3) Write Java programs that uses the following keywords…

a) this

b) super

c) static

d) final

a)

```
class Student{
int rollno;
String name;
float fee;
Student(int rollno,String name,float fee){
rollno=rollno;
name=name;
fee=fee;
}
void display(){System.out.println(rollno+" "+name+" "+fee);}
}
class TestThis1{
public static void main(String args[]){
Student s1=new Student(111,"ankit",5000f);
Student s2=new Student(112,"sumit",6000f);
s1.display();
s2.display();
}}
```

OUTPUT :

```
0 null 0.0
0 null 0.0
```

b)

```
class Superclass
{
  int num = 100;
```

```
}
//Child class or subclass or derived class
class Subclass extends Superclass
{
  /* The same variable num is declared in the Subclass
   * which is already present in the Superclass
   */
   int num = 110;
   void printNumber(){
            System.out.println(num);
   }
   public static void main(String args[]){
            Subclass obj= new Subclass();
            obj.printNumber();
   }
}
```

Output:
110

c)

```
class Student8{
  int rollno;
  String name;
  static String college ="ITS";

  Student8(int r,String n){
  rollno = r;
  name = n;
  }
 void display (){System.out.println(rollno+" "+name+" "+college);}

 public static void main(String args[]){
 Student8 s1 = new Student8(111,"Karan");
 Student8 s2 = new Student8(222,"Aryan");

 s1.display();
 s2.display();
 }
```

```
}
```

Output:

```
111 Karan ITS
      222 Aryan ITS
```

d)

```
class Gfg
{
   public static void main(String[] args)
   {
      // a final reference variable sb
      final StringBuilder sb = new StringBuilder("Geeks");

      System.out.println(sb);

      // changing internal state of object
      // reference by final reference variable sb
      sb.append("ForGeeks");

      System.out.println(sb);
   }
}
```

Output:

```
Geeks
GeeksForGeeks
```

4) Java program to implement

a) Method Overloading

b)dynamic method dispatch

c) multiple inheritance

d) access specifiers

a)

```
class Adder{
static int add(int a,int b){return a+b;}
static int add(int a,int b,int c){return a+b+c;}
}
class TestOverloading1{
public static void main(String[] args){
System.out.println(Adder.add(11,11));
System.out.println(Adder.add(11,11,11));
}}
```

Output:

```
22
33
```

b)

```
// A Java program to illustrate Dynamic Method
// Dispatch using hierarchical inheritance
class A
{
    void m1()
    {
        System.out.println("Inside A's m1 method");
    }
}

class B extends A
{
    // overriding m1()
    void m1()
    {
        System.out.println("Inside B's m1 method");
```

```
    }
}

class C extends A
{
    // overriding m1()
    void m1()
    {
        System.out.println("Inside C's m1 method");
    }
}

// Driver class
class Dispatch
{
    public static void main(String args[])
    {
        // object of type A
        A a = new A();

        // object of type B
        B b = new B();

        // object of type C
        C c = new C();

        // obtain a reference of type A
        A ref;

        // ref refers to an A object
        ref = a;

        // calling A's version of m1()
        ref.m1();

        // now ref refers to a B object
        ref = b;

        // calling B's version of m1()
        ref.m1();

        // now ref refers to a C object
        ref = c;

        // calling C's version of m1()
        ref.m1();
```

```
    }
}
```

OUTPUT:

```
Inside A's m1 method
Inside B's m1 method
Inside C's m1 method
```

C) Multiple Inheritance

Inheritance allows us to define a class in terms of another class, which makes it easier to create and maintain an application. This also provides an opportunity to reuse the code functionality and fast implementation time.

When creating a class, instead of writing completely new data members and member functions, the programmer can designate that the new class should inherit the members of an existing class. This existing class is called the **base**class, and the new class is referred to as the **derived** class.

The idea of inheritance implements the **is a** relationship.

A derived class can access all the non-private members of its base class. Thus base-class members that should not be accessible to the member functions of derived classes should be declared private in the base class.

Program code:

/* program for basic inheritance concept*/

```
#include <iostream>
 using namespace std;

// Base class
class Shape
{
  public:
    void setWidth(int w)
    {
      width = w;
    }
    void setHeight(int h)
    {
      height = h;
```

```
    }
  protected:
    int width;
    int height;
};

// Derived class
class Rectangle: public Shape
{
  public:
    int getArea()
    {
      return (width * height);
    }
};

int main(void)
{
  Rectangle Rect;

  Rect.setWidth(5);
  Rect.setHeight(7);

  // Print the area of the object.
  cout << "Total area: " << Rect.getArea() << endl;

  return 0;
}
```

Output:

Total area 35

Program code:

```
/* Program for multiple inheritance*/

#include <iostream>
using namespace std;

// Base class Shape
class Shape
{
  public:
    void setWidth(int w)
    {
      width = w;
    }
    void setHeight(int h)
```

```
    {
      height = h;
    }
  protected:
    int width;
    int height;
};

// Base class PaintCost
class PaintCost
{
  public:
    int getCost(int area)
    {
      return area * 70;
    }
};

// Derived class
class Rectangle: public Shape, public PaintCost
{
  public:
    int getArea()
    {
      return (width * height);
    }
};

int main(void)
{
  Rectangle Rect;
  int area;

  Rect.setWidth(5);
  Rect.setHeight(7);

  area = Rect.getArea();

  // Print the area of the object.
  cout << "Total area: " << Rect.getArea() << endl;

  // Print the total cost of painting
  cout << "Total paint cost: $" << Rect.getCost(area) << endl;
  return 0;
}
```

Output:

Total area: 35
Total paint cost: $2450

d)
Access specifier
Java has defined four types of access specifiers. These are :

1. Public
2. Private
3. Protected
4. Default

```
package xyz;
 import abc.AccessDemo;

 public class AccessExample
 {

     public static void main(String[] args)
     {
         AccessDemo ad = new AccessDemo();
         ad.test();
     }
 }
class AccessDemo
 {
      private int x = 56;

     public void showDemo()
     {
         System.out.println("The Variable value is " + x);
     }

     private void testDemo()
     {
         System.out.println("It cannot be accessed in another class");
     }
 }
```

```
public class AccessExample
{

    public static void main(String[] args)
    {
        AccessDemo ad = new AccessDemo();
        ad.testDemo(); // Private method cannot be used
        ad.x = 5; // Private variable cannot be used

        ad.showDemo(); // run properly
    }
}

package abc;

class AccessDemo
{
    default int a = 4;
}
package xyz;
import abc.AccessDemo;


class AccessExample
{
    public static void main(String[] args)
    {
        AccessDemo ad = new AccessDemo();
        ad.a = 67; //It is not possible.
    }
}
class AccessDemo
{
    protected int x = 34;

     public void showDemo()
    {
         System.out.println("The variable value is " + x);
     }
}
```

```
class ChildAccess extends AccessDemo
{
     // child class which inherits
     // the properties of AccessDemo class
}

public class AccessExample
{

     public static void main(String[] args)
     {
          ChildAccess ca = new ChildAccess();

          ca.showDemo(); // run properly
          ca.x = 45; // run properly
}
}
```

5) Write a Java program that

a) reads a file name from the user, and then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.

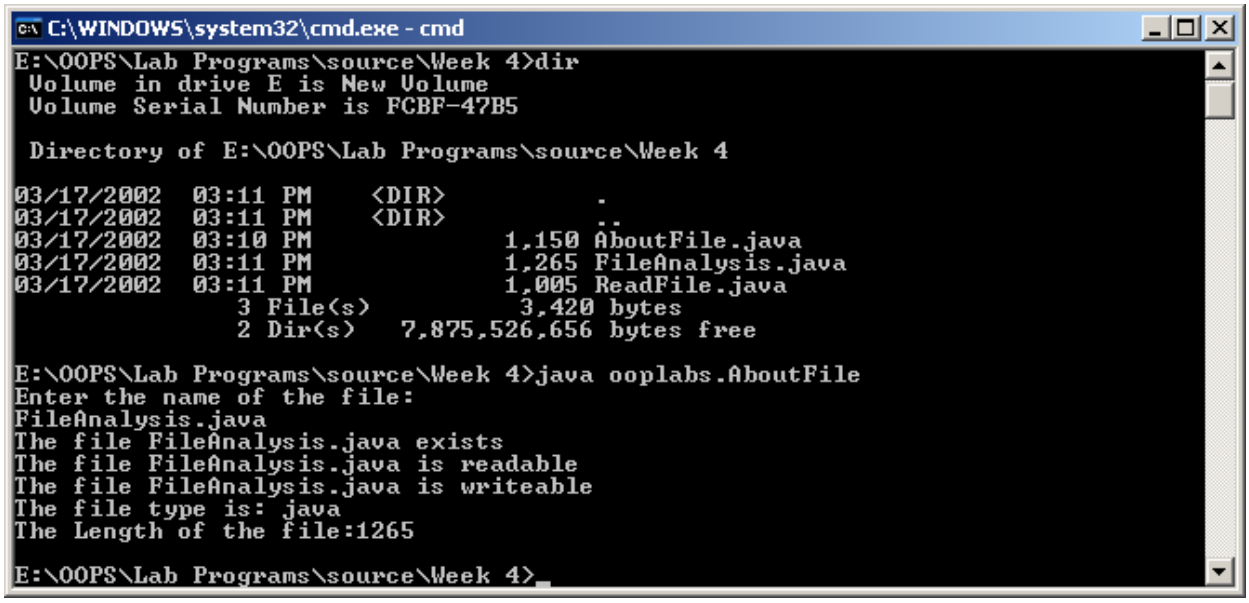
b) reads a file and displays the file on the screen, with a line number before each line.

c) displays the number of characters, lines and words in a text file.

a)

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

class AboutFile{

public static void main(String[] args){
Scanner input = new Scanner(System.in);
System.out.println("Enter the name of the file:");
String file_name = input.nextLine();
File f = new File(file_name);

if(f.exists())
System.out.println("The file " +file_name+ " exists");
else
System.out.println("The file " +file_name+ " does not exist");

if(f.exists()){
if(f.canRead())
System.out.println("The file " +file_name+ " is readable");
else
System.out.println("The file " +file_name+ " is not readable");
```

```
if(f.canWrite())
System.out.println("The file " +file_name+ " is writeable");
else
System.out.println("The file " +file_name+ " is not writeable");

System.out.println("The file type is: " +file_name.substring(file_name.indexOf('.')+1));

System.out.println("The Length of the file:" +f.length());
}

}
}
```



b)

```
import java.io.*;
class linenum
{
        public static void main(String[] args)throws IOException
        {
                FileInputStream fil;
                LineNumberInputStream line;
```

```
                int i;
                try
                {
                        fil=new FileInputStream(args[0]);
                        line=new LineNumberInputStream(fil);
                }
                catch(FileNotFoundException e)
                {
                        System.out.println("No such file found");
                        return;
                }
                do
                {
                        i=line.read();
                        if(i=='\n')
                        {
                                System.out.println();
                                System.out.print(line.getLineNumber()+" ");
                        }
                        else
                                System.out.print((char)i);
                }while(i!=-1);
                fil.close();
                line.close();
        }
}
```

Output:

Demo.java

class Demo
1 {
2 public static void main(java Demo beta gamma delta)
3 {
4 int n = 1 ;
5 System.out.println(“The word is ” + args[n]);
6 }

C)

```
import java.io.*;
class wordcount
{
```

```
public static int words=0;
public static int lines=0;
public static int chars=0;
public static void wc(InputStreamReader isr)throws IOException
{
        int c=0;
        boolean lastwhite=true;
        while((c=isr.read())!=-1)
        {
                chars++;
                if(c=='\n')
                        lines++;
                if(c=='\t' || c==' ' || c=='\n')
                        ++words;
                if(chars!=0)
                        ++chars;
        }       }
public static void main(String[] args)
{
        FileReader fr;
        try
        {
                if(args.length==0)
                {
                        wc(new InputStreamReader(System.in));
                }
                else
                {
                        for(int i=0;i<args.length;i++)
                        {
                                fr=new FileReader(args[i]);
                                wc(fr);
                        }}
        }
        catch(IOException ie)
        {
                return;
        }
        System.out.println(lines+" "+words+" "+chars);
}}
```

Output:This is II CSE

1 4 32

Draw the frequency response

1 4 58

6) Write a Java program for handling

a) Checked exceptions.

b) unchecked exceptions.

a) **Predefined Exception:** The most general of exceptions are subclasses of the standard type RuntimeException. Since java.lang is implicitly imported into all Java programs, most exceptions derived from RuntimeException are automatically available.

```
class Ex1
{
	void div()
	{
		int b=10/0;
	}
	void div1()
	{
		div();
	}
	void div2()
	{
		try
		{
			div();
		}
		catch(Exception e)
		{
			System.out.println(e);
		}
	}
	public static void main(String[] args)
	{
		Ex1 e=new Ex1();
		e.div2();
	}
}
```

O/P:
Java.lang..ArithmeticException:/by zero

User defined Exception: If you are creating your own Exception that is known as custom exception or user-defined exception. Java custom exceptions are used to customize the exception according to user need.

```
class MyException extends Exception
{
```

```
        public String toString()
        {
                return("myException");
        }
}
class MyExceptionDemo
{
        static void compute(int age) throws MyException
        {
                if(age<18)
                throw new MyException();
                else
                System.out.println("elgible");
        }
        public static void main(String[] args)
        {
                try
                {
                        compute(24);
                        compute(18);
                }
                catch(MyException e)
                {
                        System.out.println(e);
                }
        }
}
```

O/P:

MyException

7)Write a JAVA program

a) Creates three threads. First threads displays “Good Morning “for every one Second, the second thread displays “Hello” for every two seconds, the third thread Displays “Welcome” for every three seconds.

b) that correctly implements producer consumer problem using concept of inter thread communication

a)

```
class A extends Thread
{
    synchronized public void run()
    {
   try
   {
      while(true)
      {
        sleep(1000);
        System.out.println("good morning");
      }
   }
   catch(Exception e)
   { }
     }
}
class B extends Thread
{
     synchronized public void run()
     {
   try
   {
      while(true)
      {
      sleep(2000);
      System.out.println("hello");
      }
      }
     catch(Exception e)
   { }
     }
}
class C extends Thread
```

```
{
    synchronized public void run()
    {
   try
   {
      while(true)
      {
         sleep(3000);
         System.out.println("welcome");
      }
   }
   catch(Exception e)
   { }
    }
}
class ThreadDemo
{
   public static void main(String args[])
   {
      A t1=new A();
      B t2=new B();
      C t3=new C();
      t1.start();
      t2.start();
      t3.start();
   }
}
```

Output:

```
E:\javamani>java ThreadDemo
good morning
good morning
hello
good morning
welcome
good morning
hello
good morning
welcome
hello
good morning
good morning
hello
good morning
welcome
```

```
good morning
hello
good morning
good morning
hello
welcome
good morning

b)
class Q
{
    int n;
    boolean valueSet=false;
    synchronized int get()
    {
        if(!valueSet)
        try
        {
            wait();
        }
        catch(InterruptedException e)
        {
            System.out.println("Interrupted Exception caught");
        }
        System.out.println("Got:"+n);
        valueSet=false;
        notify();
        return n;
    }
    synchronized void put(int n)
    {
        if(valueSet)
        try
        {
            wait();
        }
        catch(InterruptedException e)
        {
            System.out.println("Interrupted Exception caught");
        }
        this.n=n;
        valueSet=true;
        System.out.println("Put:"+n);
        notify();
    }
}
```

```
class Producer implements Runnable
{
    Q q;
    Producer(Q q)
    {
        this.q=q;
        new Thread(this,"Producer").start();
    }
    public void run()
    {
        int i=0;
        while(true)
        {
            q.put(i++);
        }
    }
}
class Consumer implements Runnable
{
    Q q;
    Consumer(Q q)
    {
        this.q=q;
        new Thread(this,"Consumer").start();
    }
    public void run()
    {
        while(true)
        {
            q.get();
        }
    }
}
class ProdCons
{
    public static void main(String[] args)
    {
        Q q=new Q();
        new Producer(q);
        new Consumer(q);
        System.out.println("Press Control-c to stop");
    }
}
```

Output:

Put:0

Press Control-c to stop

Got:0

Put:1

Got:1

Put:2

Got:2

Put:3

Got:3

Put:4

Got:4

Put:5

Got:5

Put:6

Got:6

8. Develop an Applet that

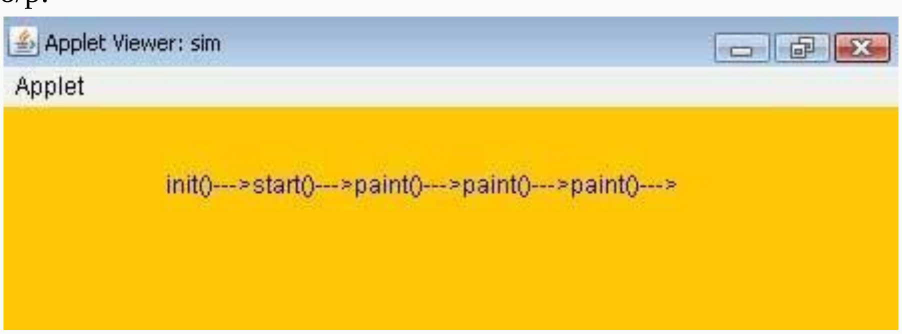
a) Displays a simple message.

b) receives an integer in one text field, and computes its factorial value and returns it in another text field , when the button named “ Compute” is clicked.

a)

```
import java.awt.*;
import java.applet.*;
/*
 <applet code="sim" width=300 height=300>
 </applet>
 */
 public class sim extends Applet
 {
        String msg=" ";
        public void init()
        {
                msg+="init()--->";
                setBackground(Color.orange);
        }
        public void start()
        {
            msg+="start()--->";
            setForeground(Color.blue);

        }
         public void paint(Graphics g)
        {
            msg+="paint()--->";
            g.drawString(msg,200,50);
        }
 }
```

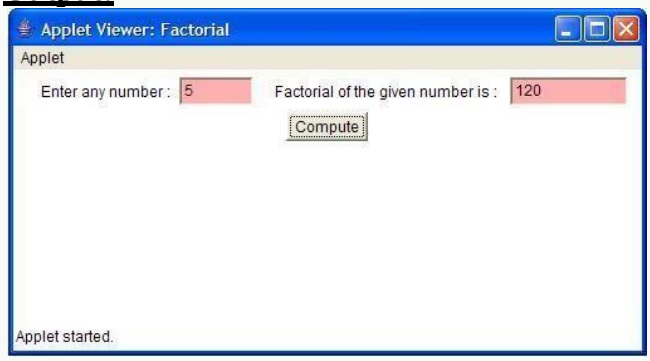
o/p:



```
b)
import java.awt.*;
import java.awt.event.*;
import java.applet.*;

/*<applet code="Factorial" width=500 height=200></applet>*/

public class Factorial extends Applet implements ActionListener
{
        TextField input,output;
        Button compute;
        int fact=0;
        public void init()
        {
                compute=new Button("Compute");
                Label inp=new Label("Enter any number :",Label.RIGHT);
                Label opt=new Label("Factorial of the given number is : ",Label.RIGHT);
                input=new TextField(5);
                output=new TextField(10);
                input.setBackground(Color.pink);
                output.setBackground(Color.pink);
                add(inp);
                add(input);
                add(opt);
                add(output);
                add(compute);
                output.setText("0");
                output.setEditable(false);
                input.addActionListener(this);
                output.addActionListener(this);
                compute.addActionListener(this);
        }
        public void actionPerformed(ActionEvent ae)
        {
                String str=ae.getActionCommand();
                if(str.equals("Compute"))
                {
                        fact=1;
                        int n=Integer.parseInt(input.getText());
                        if(n<=12)
                        {
                                for(int i=n;i>=2;i--)
                                fact=fact*i;
                                output.setText(""+fact);
                        }
```

```
                    else
                    fact=-1;

                }
                repaint();

        }
        public void paint(Graphics g)
        {
                    if(fact==-1) {
                    output.setText("0");
                    g.drawString("Sorry number exceeds greater than 12",10,100); }
        }
}
```

Output:



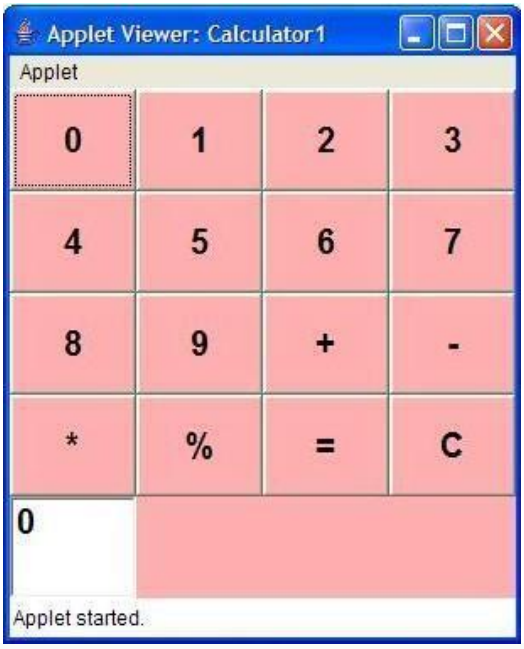
9. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +,-,*,/ operations. Add a text field to display the result.

```
import java.awt.*;
import java.awt.event.*;
import java.applet.*;
/*<applet code="Calculator1" width=300 height=300></applet>*/
public class Calculator1 extends Applet implements ActionListener
{
	TextField t;
	Button b[]=new Button[15];
	Button b1[]=new Button[6];
	String op2[]={"+","-","*","%","=","C"};
	String str1="";
	int p=0,q=0;
	String oper;
	public void init()
	{
		setLayout(new GridLayout(5,4));
		t=new TextField(20);
		setBackground(Color.pink);
		setFont(new Font("Arial",Font.BOLD,20));
		int k=0;
		t.setEditable(false);
		t.setBackground(Color.white);
		t.setText("0");
		for(int i=0;i<10;i++)
		{
			b[i]=new Button(""+k);
			add(b[i]);
			k++;
			b[i].setBackground(Color.pink);
			b[i].addActionListener(this);
		}

		for(int i=0;i<6;i++)
		{
			b1[i]=new Button(""+op2[i]);
			add(b1[i]);
			b1[i].setBackground(Color.pink);
			b1[i].addActionListener(this);
		}
		add(t);
	}
```

```
public void actionPerformed(ActionEvent ae)
{

        String str=ae.getActionCommand();

        if(str.equals("+")){      p=Integer.parseInt(t.getText());

                                  oper=str;
                                  t.setText(str1="");
                           }
         else if(str.equals("-")){ p=Integer.parseInt(t.getText());
                                   oper=str;
                                   t.setText(str1="");
                                  }
        else if(str.equals("*")){ p=Integer.parseInt(t.getText());
                                   oper=str;
                                   t.setText(str1="");
                                  }
         else if(str.equals("%")){ p=Integer.parseInt(t.getText());
                                    oper=str;

                                    t.setText(str1="");
                                }
        else if(str.equals("=")) { str1="";
                                    if(oper.equals("+")) {
                                    q=Integer.parseInt(t.getText());
                                    t.setText(String.valueOf((p+q)));}

                                    else if(oper.equals("-")) {
                                    q=Integer.parseInt(t.getText());
                                    t.setText(String.valueOf((p-q))); }

                                    else if(oper.equals("*")){
                                    q=Integer.parseInt(t.getText());
                                    t.setText(String.valueOf((p*q))); }

                                    else if(oper.equals("%")){
                                    q=Integer.parseInt(t.getText());
                                    t.setText(String.valueOf((p%q))); }
                                }

        else if(str.equals("C")){ p=0;q=0;
                                    t.setText("");
                                    str1="";
                                    t.setText("0");
                                  }
```

```
        else{ t.setText(str1.concat(str));
                        str1=t.getText();
                    }

                }

}
```

Output:



10. Write a Java Program for handling

a) Mouse events

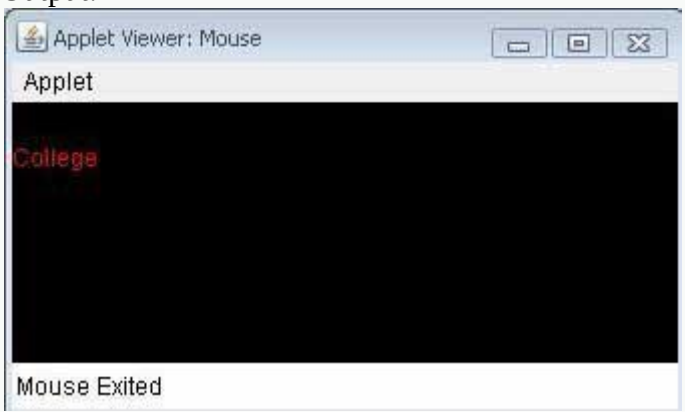
b) key events

a)

```
import java.awt.*;
import java.awt.event.*;
import java.applet.*;
/*
<applet code="Mouse" width=500 height=500>
</applet>
*/
public class Mouse extends Applet
implements MouseListener,MouseMotionListener
{
        int X=0,Y=20;
        String msg="MouseEvents";
        public void init()
        {
                addMouseListener(this);
                addMouseMotionListener(this);
                setBackground(Color.black);
                setForeground(Color.red);
        }
        public void mouseEntered(MouseEvent m)
        {
                setBackground(Color.magenta);
                showStatus("Mouse Entered");
                repaint();
        }
        public void mouseExited(MouseEvent m)
        {
                setBackground(Color.black);
                showStatus("Mouse Exited");
                repaint();
        }
        public void mousePressed(MouseEvent m)
        {
                X=10;
                Y=20;
                msg="NEC";
                setBackground(Color.green);
                repaint();
        }
        public void mouseReleased(MouseEvent m)
```

```
        {
                X=10;
                Y=20;
                msg="Engineering";
                setBackground(Color.blue);
                repaint();
        }
        public void mouseMoved(MouseEvent m)
        {
                X=m.getX();
                Y=m.getY();
                msg="College";
                setBackground(Color.white);
                showStatus("Mouse Moved");
                repaint();
        }
        public void mouseDragged(MouseEvent m)
        {
                msg="CSE";
                setBackground(Color.yellow);
                showStatus("Mouse Moved"+m.getX()+" "+m.getY());
                repaint();
        }
        public void mouseClicked(MouseEvent m)
        {
                msg="Students";
                setBackground(Color.pink);
                showStatus("Mouse Clicked");
                repaint();
        }
        public void paint(Graphics g)
        {
                g.drawString(msg,X,Y);
        }
}
```

Output:



b) Key events

```
import java.awt.*;
import java.awt.event.*;
import java.applet.*;
/*
<applet code="Key" width=300 height=400>
</applet>
*/
public class Key extends Applet
implements KeyListener
{
        int X=20,Y=30;
        String msg="KeyEvents--->";
        public void init()
        {
                addKeyListener(this);
                requestFocus();
                setBackground(Color.green);
                setForeground(Color.blue);
        }
        public void keyPressed(KeyEvent k)
        {
                showStatus("KeyDown");
                int key=k.getKeyCode();
                switch(key)
                {
                        case KeyEvent.VK_UP:
                                showStatus("Move to Up");
                                break;
                        case KeyEvent.VK_DOWN:
                                showStatus("Move to Down");
                                break;
                        case KeyEvent.VK_LEFT:
                                showStatus("Move to Left");
                                break;
                        case KeyEvent.VK_RIGHT:
                                showStatus("Move to Right");
                                break;
                }
                repaint();
        }
        public void keyReleased(KeyEvent k)
        {
                showStatus("Key Up");
        }
```

```
        public void keyTyped(KeyEvent k)
        {
                msg+=k.getKeyChar();
                repaint();
        }
        public void paint(Graphics g)
        {
                g.drawString(msg,X,Y);
        }
}
```

11. Write a Java 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 on the result field when the divide button is clicked. If num1 and num2 were not an integer, the program would throw number format exception. If num2 was zero , the program would throw an arithmetic exception and display the exception in message dialogue box.

```
import java.awt.*;
import java.awt.event.*;
import java.applet.*;
/*<applet code="Div"width=230 height=250>
</applet>*/
public class Div extends Applet implements ActionListener
{
String msg;
TextField num1,num2,res;Label l1,l2,l3;
Button div;
public void init()
{
l1=new Label("Number 1");
l2=new Label("Number 2");
l3=new Label("result");
num1=new TextField(10);
num2=new TextField(10);
res=new TextField(10);
div=new Button("DIV");
div.addActionListener(this);
add(l1);
add(num1);
add(l2);
add(num2);
add(l3);
add(res);
add(div);
}
public void actionPerformed(ActionEvent ae)
{
String arg=ae.getActionCommand();
if(arg.equals("DIV"))
{
String s1=num1.getText();
String s2=num2.getText();
int num1=Integer.parseInt(s1);
int num2=Integer.parseInt(s2);
```

```
if(num2==0)
{
try
{
System.out.println(" ");
}
catch(Exception e)
{
System.out.println("ArithematicException"+e);
}
msg="Arithemetic";
repaint();
}
else if((num1<0)||(num2<0))
{
try
{
System.out.println("");
}
catch(Exception e)
{
System.out.println("NumberFormat"+e);
}
msg="NumberFormat";
repaint();
}
else
{
int num3=num1/num2;
res.setText(String.valueOf(num3));
}
}
}
public void paint(Graphics g)
{
g.drawString(msg,30,70);
}
}
```

Output

12. Write a JAVA program that

a) Simulate traffic light. The program lets the user select one of three lights :red green or yellow. When a radio button is selected, the light is turned on and only one light can be on at a time. No light is on when the program starts.

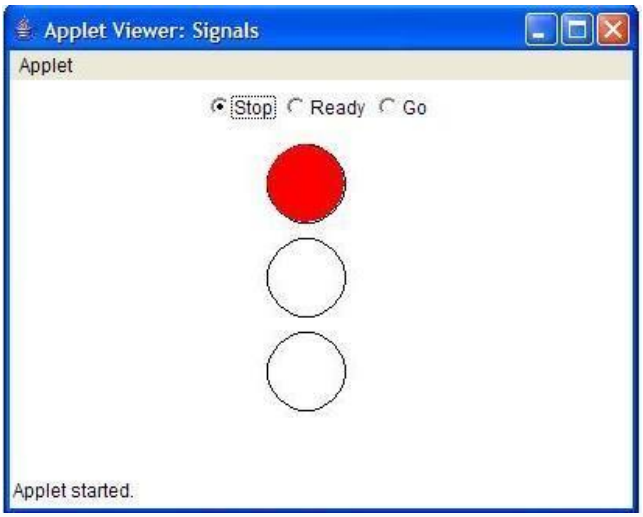
b)allows the user to draw lines rectangles and ovals.

a)

```
import java.applet.*;
import java.awt.*;
import java.awt.event.*;
/*<applet code="Signals" width=400 height=250></applet>*/
public class Signals extends Applet implements ItemListener
{
	String msg="";
	Checkbox stop,ready,go;
	CheckboxGroup cbg;
	public void init()
	{
		cbg = new CheckboxGroup();
		stop = new Checkbox("Stop", cbg, false);
		ready = new Checkbox("Ready", cbg, false);
		go= new Checkbox("Go", cbg, false);
		add(stop);
		add(ready);
		add(go);
		stop.addItemListener(this);
		ready.addItemListener(this);
		go.addItemListener(this);

	}

	public void itemStateChanged(ItemEvent ie)
	{
		repaint();
	}

	public void paint(Graphics g)
	{

		msg=cbg.getSelectedCheckbox().getLabel();
		g.drawOval(165,40,50,50);
		g.drawOval(165,100,50,50);
```

```
                g.drawOval(165,160,50,50);



        if(msg.equals("Stop"))
                {
                        g.setColor(Color.red);
                        g.fillOval(165,40,50,50);
                }
                else if(msg.equals("Ready"))
                {
                        g.setColor(Color.yellow);
                        g.fillOval(165,100,50,50);
                }
                else
                {
                        g.setColor(Color.green);
                        g.fillOval(165,160,50,50);
                }

        }
}
```

Output:



b)

```
import java.awt.*;
import java.applet.*;
/*
<applet code="Sujith" width=200 height=200>
```

```
</applet>
*/
public class Sujith extends Applet
{
	public void paint(Graphics g)
	{
		for(int i=0;i<=250;i++)
		{
			Color c1=new Color(35-i,55-i,110-i);
			g.setColor(c1);
			g.drawRect(250+i,250+i,100+i,100+i);
			g.drawOval(100+i,100+i,50+i,50+i);
			g.drawLine(50+i,20+i,10+i,10+i);
		}
	}
}
```

Output: