Smt. Chandibai Himathmal Mansukhani College

USCS3P01:USCS303-Operating System (OS) Practical-05

Threads

Contents

Practical Date: 13th August,2021

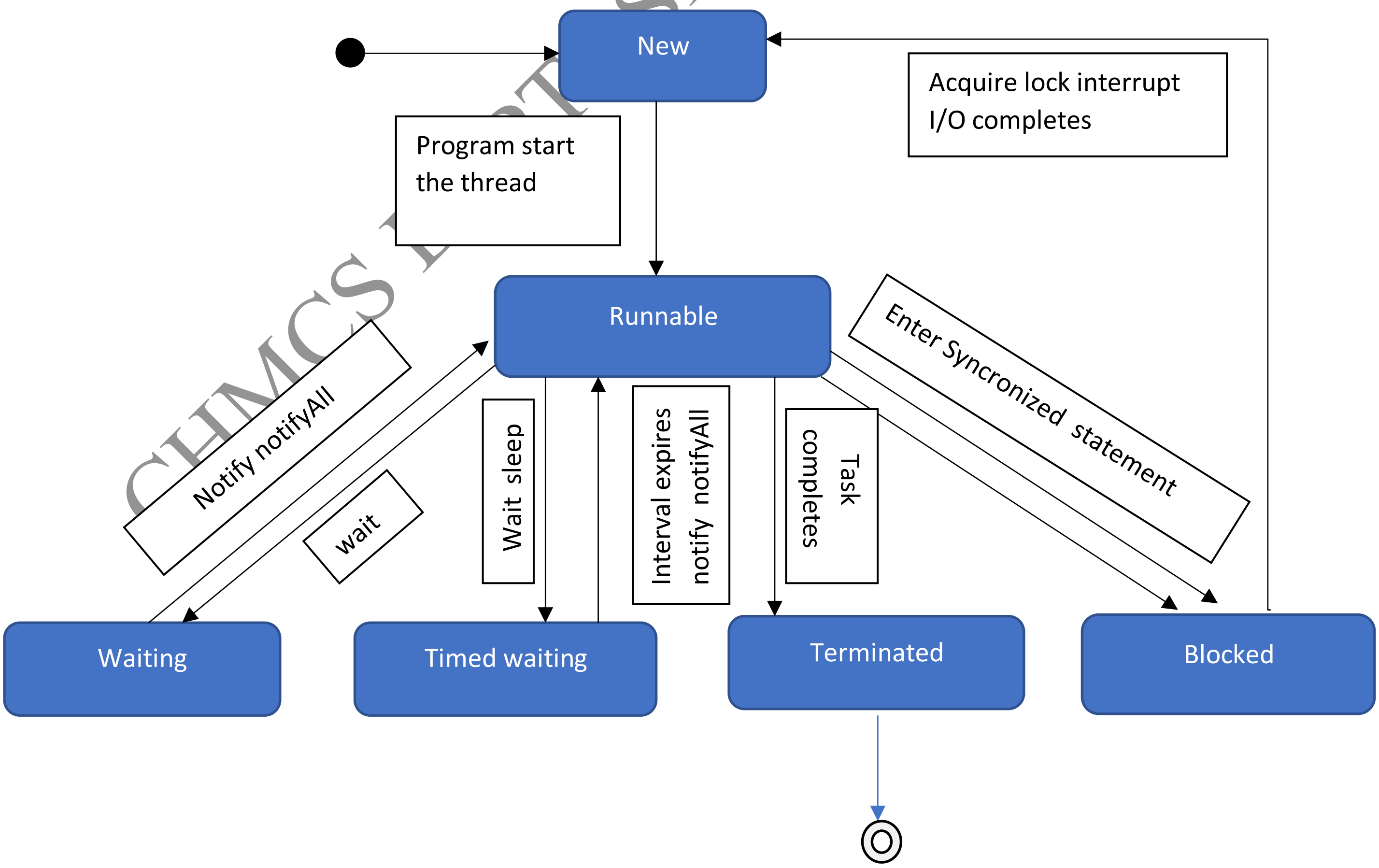
Practical Aim: Threads(Multi-Threading)

Thread States: Life Cycle of a Threads

Thread States: Life Cycle of a Threads

A java thread can be in any of following thread states during its life cycle i.e.

- New,
- Runnable,
- Blocked,
- Waiting,
- Timed Waiting or Terminated.



1. **New and Runnable States :**

- A new thread begins its life cycle in the new state.
- It remains in this state until the program starts the thread , which places in the running state.
- A thread in the runnable state is considered to be excuting its task.

2. **Waiting State:**

- Sometimes a runnable thread transition to the waiting state while it waits for another thread to perform a task.
- A waiting thread transition back to the runnable state only when another thread notifies it to continue executing .

3. **Timed Waiting State:**

- A runnable thread can enter the timed waiting state for a specified interval of time . It transition back to the runnable state when the time interval expires or when the event it's waiting for occurs .

4. **Blocked State:**

- A runnable thread transition to the blocked state when it attempts to perform a task that cannot be complete immediately and it must temporarily wait until the task completes.

5. **Terminated State:**

- A runnable thread enters the terminated state (sometimes called dead state) when it successfully completes its task or otherwise terminates (perhaps due to an error).

Summation

Summation

Question-01:

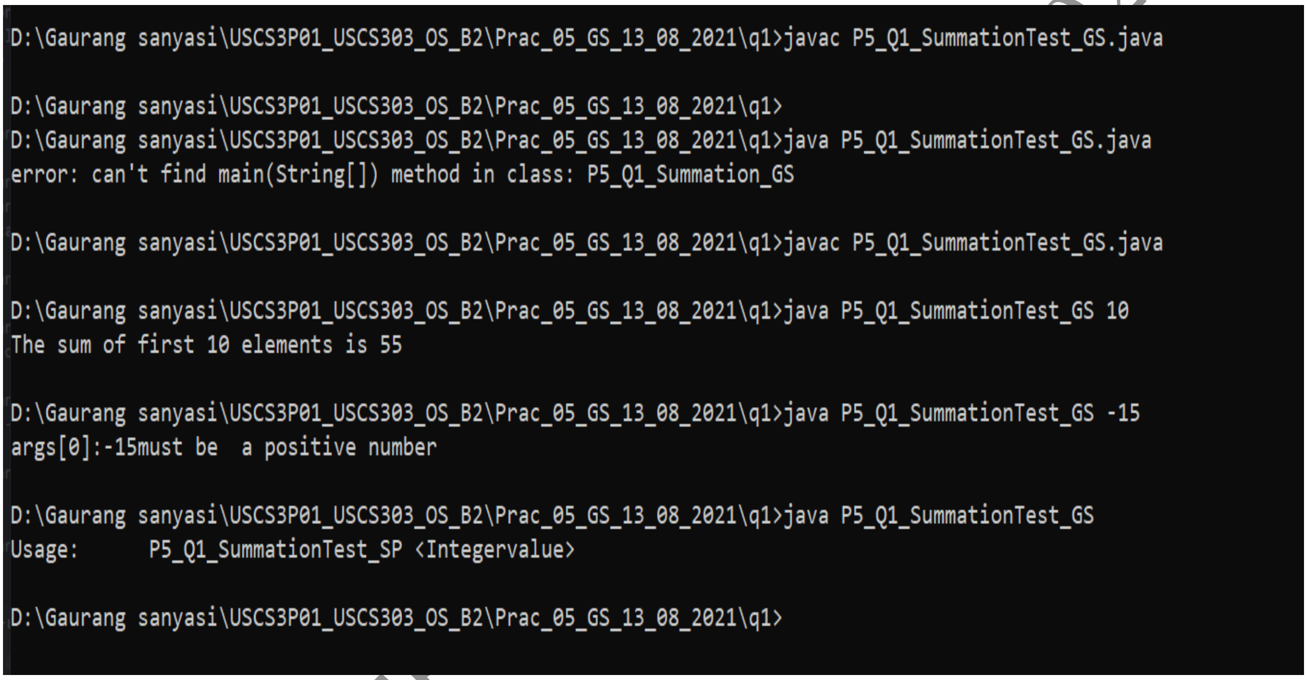
Write a multithreaded java program that determines the summation of a non -negative integer. The Summation class implements the Runnable interface . Thread creation is performed by creating an object instance of the Thread class and passing the constructor a Runnable object.

Source Code:

```
//Name: Gaurang Sanyasi

// Batch: B2

// PRN: 202001640078546

// Date: 13th August 2021

// Prac-05: Threads


class P5_Q1_Summation_BL implements Runnable

{

        int upperLimit,sum;

        public P5_Q1_Summation_BL(int upperLimit)

        {

                this.upperLimit=upperLimit;

        }

        public void run()

        {

                for(int i =1;i<=upperLimit;i++)

                        sum +=i;

        }

}//ends of class P5_Q1_Summation_GS
```

```
public class P5_Q1_SummationTest_GS
{
        public static void main(String args[])
        {
                if(args.length<= 0)
                        System.out.println("Usage:
P5_Q1_SummationTest_BL<integervalue>");
                else
           {
                        int upp = Integer.parseInt(args[0]);
                        if(upp<=0)
                                System.out.println("args[0]:" + args[0] + " must be a
positive number");
                        else
                        {
                                P5_Q1_Summation_BL s = new
P5_Q1_Summation_BL(upp);
                                Thread t = new Thread(s);
                                t.start();
                                try{
                                        t.join();
                                        System.out.println("The sum of first " + upp + "
elements is " + (s.sum));
                                }
                                catch(Exception e){
                                        e.printStackTrace();
                                }
                        }//inner else ends
                }//outer else ends
        }//main ends
}//end of class class P5_Q1_SummationTest_GS
```

Output:



```
D:\Gaurang sanyasi\USCS3P01_USCS303_OS_B2\Prac_05_GS_13_08_2021\q1>javac P5_Q1_SummationTest_GS.java

D:\Gaurang sanyasi\USCS3P01_USCS303_OS_B2\Prac_05_GS_13_08_2021\q1>
D:\Gaurang sanyasi\USCS3P01_USCS303_OS_B2\Prac_05_GS_13_08_2021\q1>java P5_Q1_SummationTest_GS.java
error: can't find main(String[]) method in class: P5_Q1_Summation_GS

D:\Gaurang sanyasi\USCS3P01_USCS303_OS_B2\Prac_05_GS_13_08_2021\q1>javac P5_Q1_SummationTest_GS.java

D:\Gaurang sanyasi\USCS3P01_USCS303_OS_B2\Prac_05_GS_13_08_2021\q1>java P5_Q1_SummationTest_GS 10
The sum of first 10 elements is 55

D:\Gaurang sanyasi\USCS3P01_USCS303_OS_B2\Prac_05_GS_13_08_2021\q1>java P5_Q1_SummationTest_GS -15
args[0]:-15must be  a positive number

D:\Gaurang sanyasi\USCS3P01_USCS303_OS_B2\Prac_05_GS_13_08_2021\q1>java P5_Q1_SummationTest_GS
Usage:      P5_Q1_SummationTest_SP <Integervalue>

D:\Gaurang sanyasi\USCS3P01_USCS303_OS_B2\Prac_05_GS_13_08_2021\q1>
```

Primes

Primes

Question-02:
Write a multithreaded java program that outputs prime numbers. This program should work as follows :

The user will run the program and will enter a number on the command line. The program will then create a separate thread that outputs all the prime numbers less than or equal to the numbers entered by the user.

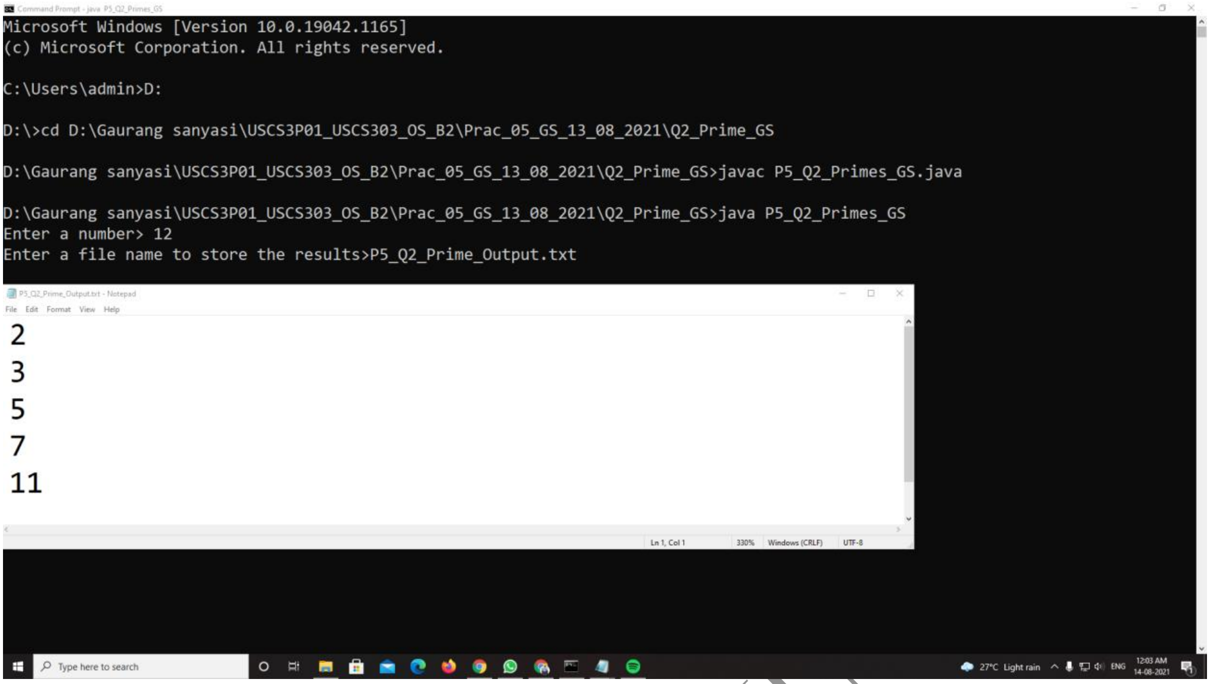
Source Code 1:

```
//Name: : Gaurang Sanyasi
// Batch: B2
// PRN: 2020016400785456
// Date: 13th August 2021
// Prac-05: Threads

import java.io.*;
import java.util.*;
public class P5_Q2_Primes_GS {
        public static void main(String args[]){
                try{
                        P5_Q2_PrimeThread_GS pt = null;
                        System.out.print("Enter a number> ");
                        Scanner scan = new Scanner(System.in);
                        int limit = scan.nextInt();
                        System.out.print("Enter a file name to store the results>");
                        String fName = scan.next();
                if(fName.length()>0)
                        pt = new P5_Q2_PrimeThread_GS(limit, new
FileOutputStream(fName));
                else
                        pt = new P5_Q2_PrimeThread_GS(limit);
                pt.run();
        }catch(Exception e){
                e.printStackTrace();
        }
   }//main ends
}//class ends
```

Source Code 2:

```
//Name: Gaurang Sanyasi
// Batch: B2
// PRN: 202001640078546
// Date: 13th August 2021
// Prac-05: Threads

import java.io.*;
class P5_Q2_PrimeThread_GS extends Thread {
        private PrintStream pOut = null;
        private int limit = 0;


        //default constructor.does nothing
        public P5_Q2_PrimeThread_GS(){
      }
//constructor to set the number below which to generate primes
//no output stream is specified,so it outputs to the System.out
        public P5_Q2_PrimeThread_GS(int I){
                limit = I;
                try{
                        pOut = System.out;
                }catch(Exception e){
                        e.printStackTrace();
                }
        }
//constructor that sets both the number, as above, and specifies an output stream
//if the specified stream is null, uses System.out
public P5_Q2_PrimeThread_GS(int I, OutputStream outS){
        limit = I;
        try{
          if(outS != null){
                        pOut = new PrintStream(outS);
               }else{
                        pOut = System.out;
                     }
           } catch(Exception e){
                        e.printStackTrace();
                     }
        }
        //method that performs the work of the thread,
        //in this case the generation of prime numbers.
        public void run(){
                //compute primes via the seive
                boolean numbers[] = new boolean[limit+1];
                numbers[0] = false;
                numbers[1] = false;
                for(int i = 2; i<numbers.length; i++){
                        numbers[i] = true;
                }
                for(int i = 2; i<numbers.length; i++){
                        if(numbers[i]){
                         for(int j=(2*i);j< numbers.length;j+=i){
                                numbers[j] = false;
                }//inner for ends
              }//if ends
             }//outer for ends
           for(int i=0;i< numbers.length;i++){
                if(numbers[i])
                        pOut.println(i);
             }//for ends
        }//run ends
}//class ends
```

Output:


Command Prompt - java P5_Q2_Primes_GS
P5_Q2_Prime_Output.txt - Notepad
File Edit Format View Help
Ln 1, Col 1
330%
Windows (CRLF)
UTF-8
Type here to search
27°C Light rain
ENG
12:03 AM
14-08-2021

```
Microsoft Windows [Version 10.0.19042.1165]
(c) Microsoft Corporation. All rights reserved.

C:\Users\admin>D:

D:\>cd D:\Gaurang sanyasi\USCS3P01_USCS303_OS_B2\Prac_05_GS_13_08_2021\Q2_Prime_GS

D:\Gaurang sanyasi\USCS3P01_USCS303_OS_B2\Prac_05_GS_13_08_2021\Q2_Prime_GS>javac P5_Q2_Primes_GS.java

D:\Gaurang sanyasi\USCS3P01_USCS303_OS_B2\Prac_05_GS_13_08_2021\Q2_Prime_GS>java P5_Q2_Primes_GS
Enter a number> 12
Enter a file name to store the results>P5_Q2_Prime_Output.txt
```

```
2
3
5
7
11
```

Fibonacci

Febonacci

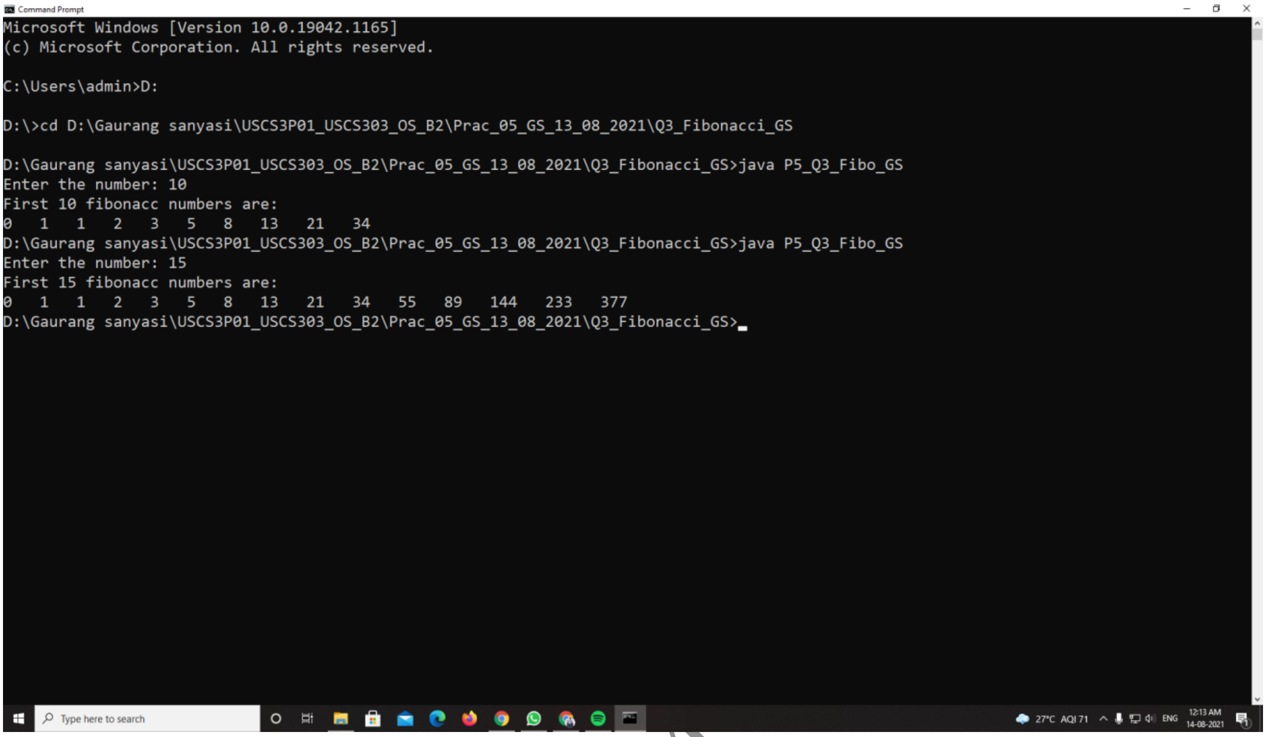
Question-03:

The Fibonacci sequence is the series of numbers 0, 1, 1, 2, 3, 5, 8, ….Formally, it can be expressed as : $fib_0 = 0$, fib1 = 1, fibn = fibn-1 + fibn-2.Write a multithreaded program that generates the Fibonacci sequence using either the Java.

Source Code:

```
//Name: Gaurang Sanyasi
// Batch: B2
// PRN: 2020016400785466
// Date: 13th August 2021
// Prac-05: Threads

import java.util.ArrayList;
import java.util.Scanner;

public class P5_Q3_Fibo_GS
{
        public static void main(String args[]){
                Scanner scan = new Scanner(System.in);
                ArrayList al = new ArrayList();
                int a;
                System.out.print("Enter the number: ");
                a = scan.nextInt();
                P5_Q3_FiboThread_BL fibTh = new P5_Q3_FiboThread_GS(a);
                fibTh.start();
                try{
                        fibTh.join();
                }catch(InterruptedException ex){
                        ex.printStackTrace();
                }
                int fseries[] = fibTh.arr;
                System.out.println("First "+a+" fibonacc numbers are:");
                for(int i=0;i<a;i++){
                        System.out.print(fseries[i]+ "    ");
                }
        }//main ends
}//class ends
class P5_Q3_FiboThread_GS extends Thread
{
        private int a,i;
        Thread t;
        int arr[];

        public P5_Q3_FiboThread_GS(int a){
                this.a = a;
                arr = new int[a];
        }
        public void run(){
                arr[0] = 0;
                arr[1] = 1;
                for(i=2;i<a;i++){
                        arr[i] = arr[i-1] + arr[i-2];
                }
        }//run ends
}//class ends
```

Output :



```
Microsoft Windows [Version 10.0.19042.1165]
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C:\Users\admin>D:

D:\>cd D:\Gaurang sanyasi\USCS3P01_USCS303_OS_B2\Prac_05_GS_13_08_2021\Q3_Fibonacci_GS

D:\Gaurang sanyasi\USCS3P01_USCS303_OS_B2\Prac_05_GS_13_08_2021\Q3_Fibonacci_GS>java P5_Q3_Fibo_GS
Enter the number: 10
First 10 fibonacc numbers are:
0   1   1   2   3   5   8   13   21   34
D:\Gaurang sanyasi\USCS3P01_USCS303_OS_B2\Prac_05_GS_13_08_2021\Q3_Fibonacci_GS>java P5_Q3_Fibo_GS
Enter the number: 15
First 15 fibonacc numbers are:
0   1   1   2   3   5   8   13   21   34   55   89   144   233   377
D:\Gaurang sanyasi\USCS3P01_USCS303_OS_B2\Prac_05_GS_13_08_2021\Q3_Fibonacci_GS>_
```