

Smt. Chandibai Himathmal Mansukhani College

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

Threads

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Practical Date: 13th August,2021(Friday)

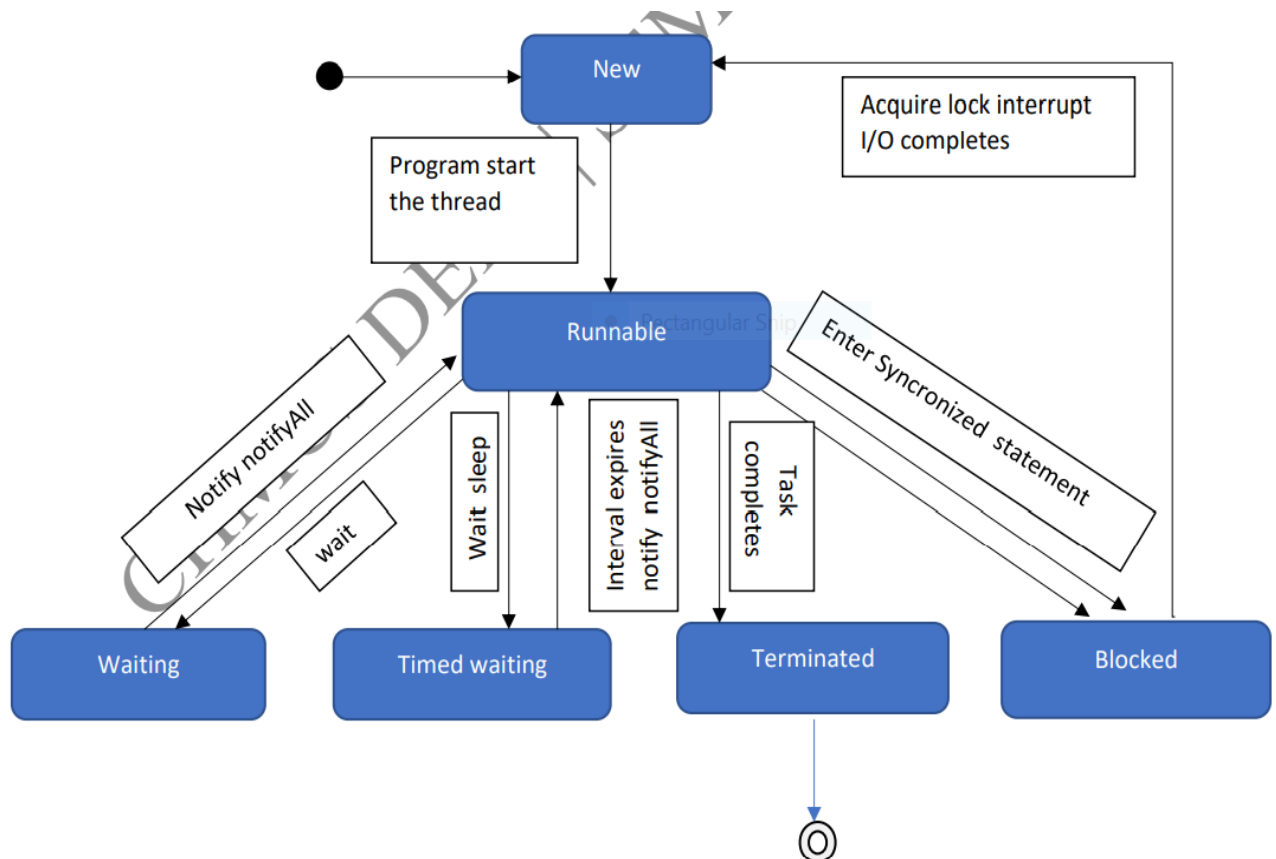
Practical Aim: Threads(Multi-Threading)

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



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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 executing 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).

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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:Yash Parab
//Batch No: B1
//PRN:2020016400922513
//Date:14-08-2021
class P5_Q1_Summation_YP implements Runnable

{
    int upperLimit,sum;

    public P5_Q1_Summation_YP(int upperLimit)

    {

        this.upperLimit=upperLimit;

    }

    public void run()

    {
```

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

            sum +=i;

    }

} //ends of class P5_Q1_Summation_YP

public class P5_Q1_SummationTest_YP

{

    public static void main(String args[])

    {

        if(args.length<= 0)

            System.out.println("Usage: P5_Q1_SummationTest_YP<integervalue>");

        else

        {

            int upp = Integer.parseInt(args[0]);

            if(upp<=0)

                System.out.println("args[0]:" + args[0] + " must be a positive

number");

            else
```

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```
{

    P5_Q1_Summation_YP s = new P5_Q1_Summation_YP(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_YP
```

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Output:

```
C:\USCSP301_USCSP303_OS_B1\Prac_05_YashParab_14_08_2021\Q1_Summation_YP>javac P5_Q1_SummationTest_YP.java
C:\USCSP301_USCSP303_OS_B1\Prac_05_YashParab_14_08_2021\Q1_Summation_YP>java P5_Q1_SummationTest_YP 10
The sum of first 10 elements is 55
C:\USCSP301_USCSP303_OS_B1\Prac_05_YashParab_14_08_2021\Q1_Summation_YP>java P5_Q1_SummationTest_YP 100
The sum of first 100 elements is 5050
```

```
C:\USCSP301_USCSP303_OS_B1\Prac_05_YashParab_14_08_2021\Q1_Summation_YP>javac P5_Q1_SummationTest_YP.java
C:\USCSP301_USCSP303_OS_B1\Prac_05_YashParab_14_08_2021\Q1_Summation_YP>java P5_Q1_SummationTest_YP
Usage: P5_Q1_SummationTest_YP<integervalue>
```

```
C:\USCSP301_USCSP303_OS_B1\Prac_05_YashParab_14_08_2021\Q1_Summation_YP>javac P5_Q1_SummationTest_YP.java
C:\USCSP301_USCSP303_OS_B1\Prac_05_YashParab_14_08_2021\Q1_Summation_YP>java P5_Q1_SummationTest_YP -15
args[0]:-15 must be a positive number
```

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.

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Source Code 1:

//Name:Yash Parab

//Batch No: B1

//PRN:2020016400922513

//Date:14-08-2021

import java.io.*;

import java.util.*;

public class P5_Q2_Primes_YP {

 public static void main(String args[]){

 try{

 P5_Q2_PrimeThread_YP 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)

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```
        pt = new P5_Q2_PrimeThread_YP(limit, new
FileOutputStream(fName));

        else

        pt = new P5_Q2_PrimeThread_YP(limit);

        pt.run();

    }catch(Exception e){

        e.printStackTrace();

    }

} //main ends

} //class ends
```

Source Code 2:

```
//Name: Yash Parab
//Batch No: B1
//PRN: 2020016400922513
//Date: 14-08-2021

import java.io.*;

class P5_Q2_PrimeThread_YP extends Thread {
```

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```
private PrintStream pOut = null;
```

```
private int limit = 0;
```

```
//default constructor.does nothing
```

```
public P5_Q2_PrimeThread_YP(){
```

```
}
```

```
//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_YP(int I){
```

```
    limit = I;
```

```
    try{
```

```
        pOut = System.out;
```

```
    }catch(Exception e){
```

```
        e.printStackTrace();
```

```
    }
```

```
}
```

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//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_YP(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.

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```
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
```

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```
for(int i=0;i< numbers.length;i++){
```

```
    if(numbers[i])
```

```
        pOut.println(i);
```

```
    }//for ends
```

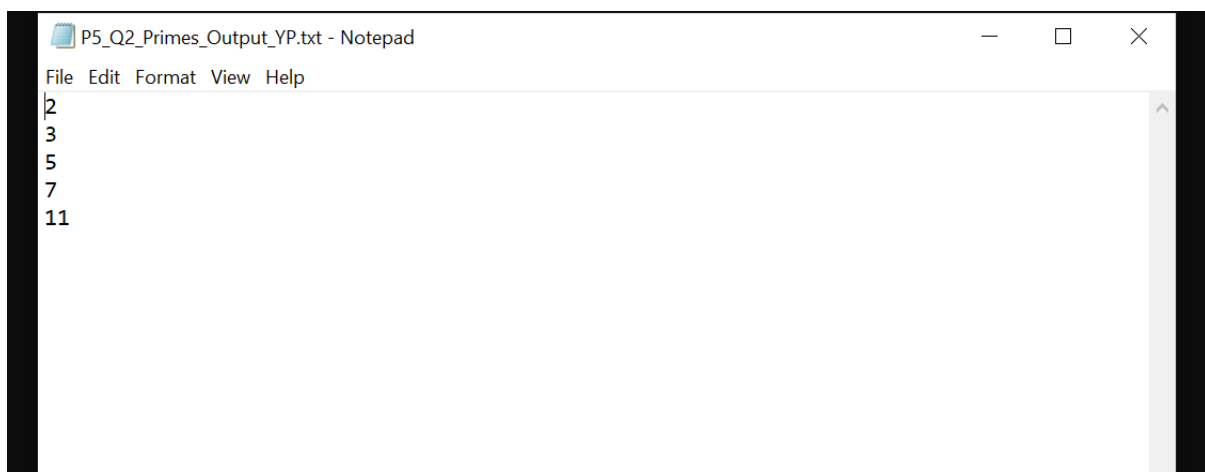
```
}//run ends
```

```
}//class ends
```

Output:

Command Prompt

```
C:\USCSP301_USCSP303_OS_B1\Prac_05_YashParab_14_08_2021\Q2_Prime_YP>javac P5_Q2_Primes_YP.java
C:\USCSP301_USCSP303_OS_B1\Prac_05_YashParab_14_08_2021\Q2_Prime_YP>java P5_Q2_Primes_YP
Enter a number>12
Enter a file name to store the results > P5_Q2_Primes_Output_YP.txt
```



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Fibonacci

Fibonacci

Question-03:

The Fibonacci sequence is the series of numbers 0, 1, 1, 2, 3, 5, 8,Formally, it can be expressed as : $fib_0 = 0$, $fib_1 = 1$, $fib_n = fib_{n-1} + fib_{n-2}$. Write a multithreaded program that generates the Fibonacci sequence using either the Java.

Source Code:

```
//Name:Yash Parab
```

```
//Batch No: B1
```

```
//PRN:2020016400922513
```

```
//Date:14-08-2021
```

```
import java.util.ArrayList;
```

```
import java.util.Scanner;
```

```
public class P5_Q3_Fibo_YP
```

```
{
```

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

```
        Scanner scan = new Scanner(System.in);
```

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```
ArrayList al = new ArrayList();

int a;

System.out.println("Enter the number: ");

a = scan.nextInt();

P5_Q3_FiboThread_YP fibTh = new P5_Q3_FiboThread_YP(a);

fibTh.start();

try{

    fibTh.join();

}catch(InterruptedException ex){

    ex.printStackTrace();

}

int fseries[] = fibTh.arr;

System.out.println("First "+a+" fibonacci numbers are:");

for(int i=0;i<a;i++){

    System.out.println(fseries[i]+ " ");

}
```

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```
}
```

```
}//main ends
```

```
}//class ends
```

```
class P5_Q3_FiboThread_YP extends Thread
```

```
{
```

```
    private int a,i;
```

```
    Thread t;
```

```
    int arr[];
```

```
    public P5_Q3_FiboThread_YP(int a){
```

```
        this.a = a;
```

```
        arr = new int[a];
```

```
    }
```

```
    public void run(){
```

```
        arr[0] = 0;
```


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```
arr[1] = 1;

for(i=2;i<a;i++){

    arr[i] = arr[i-1] + arr[i-2];

}

} //run ends

} //class ends
```

Output:

```
C:\USCSP301_USCSP303_OS_B1\Prac_05_YashParab_14_08_2021\Q2_Prime_YP>cd C:\USCSP301_USCSP303_OS_B1\Prac_05_YashParab_14_08_2021\Q3_Fibonacci_YP
C:\USCSP301_USCSP303_OS_B1\Prac_05_YashParab_14_08_2021\Q3_Fibonacci_YP>javac P5_Q3_Fibo_YP.java
C:\USCSP301_USCSP303_OS_B1\Prac_05_YashParab_14_08_2021\Q3_Fibonacci_YP>java P5_Q3_Fibo_YP
Enter the number:
10
First 10 fibonacci numbers are:
0
1
1
2
3
5
8
13
21
34
```