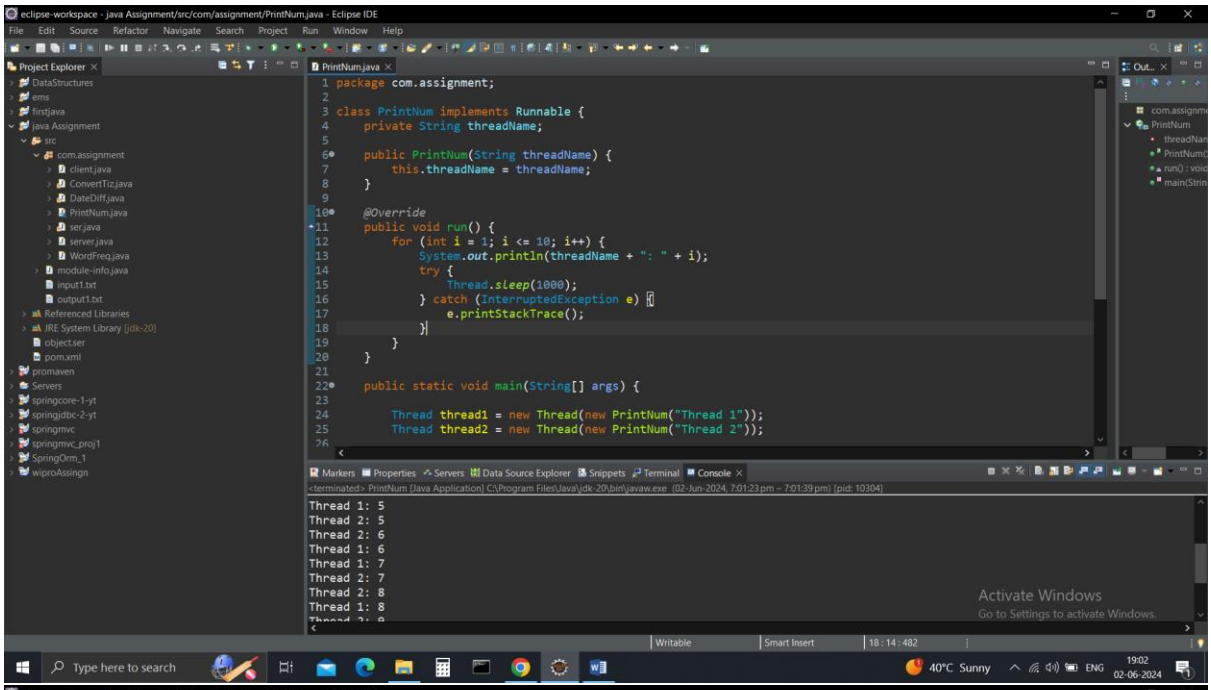
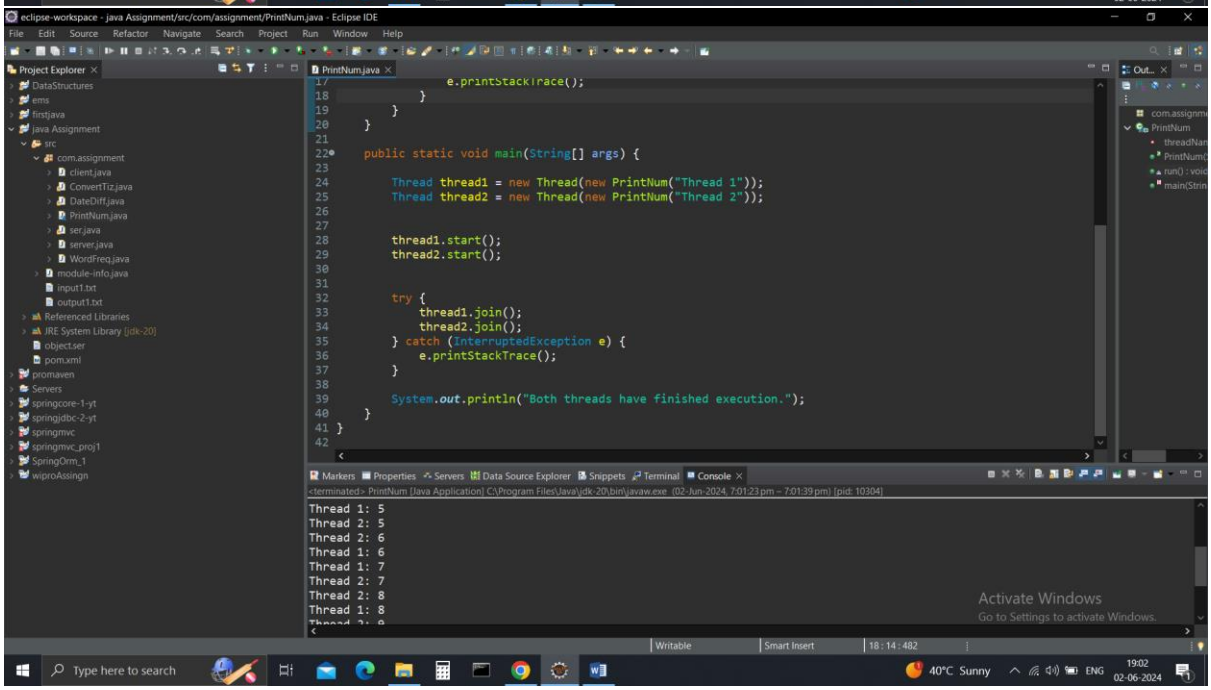
Task 1: Creating and Managing Threads

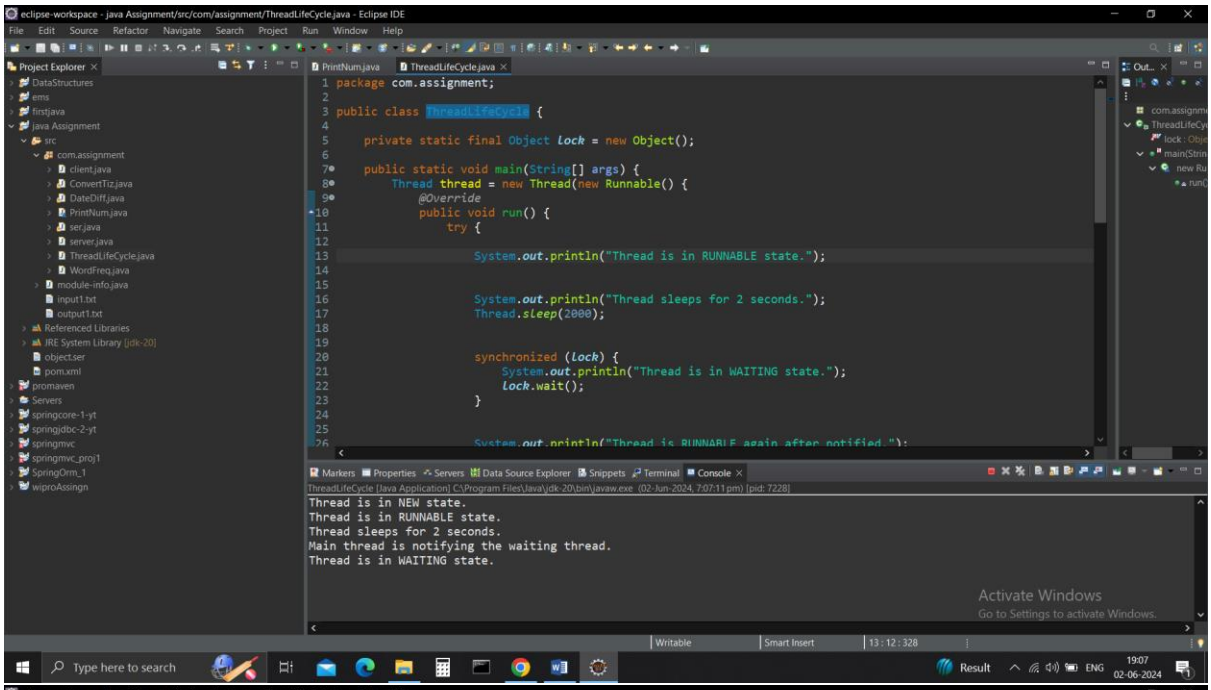
Write a program that starts two threads, where each thread prints numbers from 1 to 10 with a 1-second delay between each number

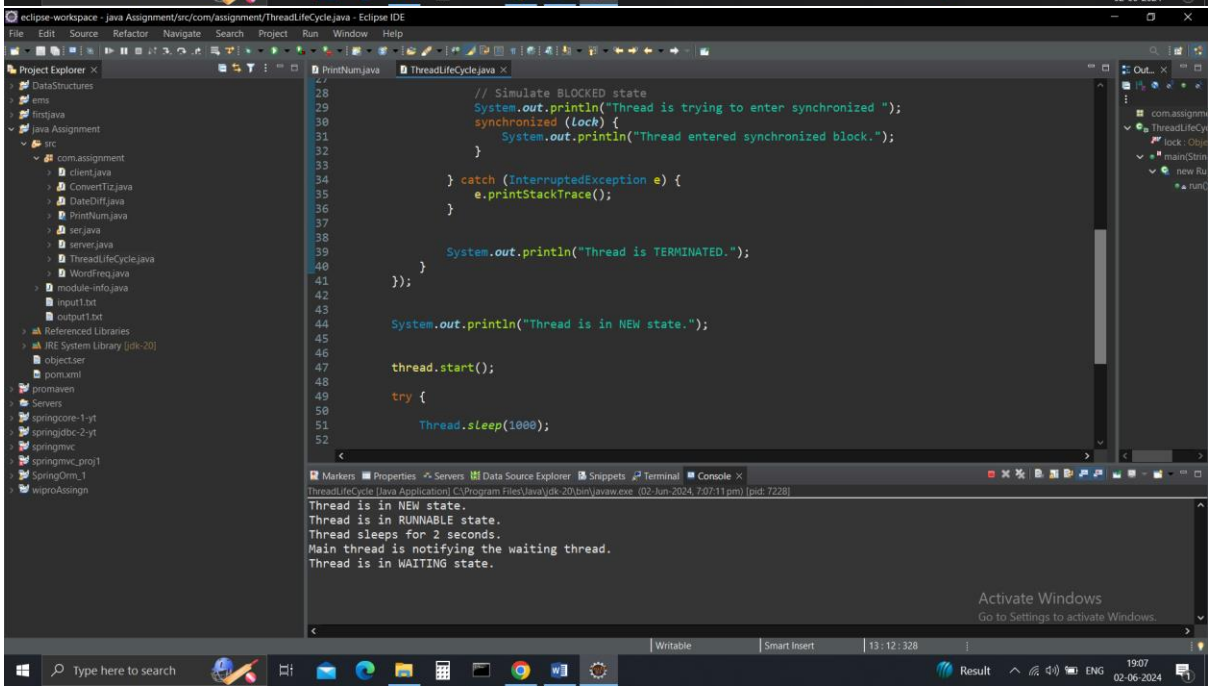


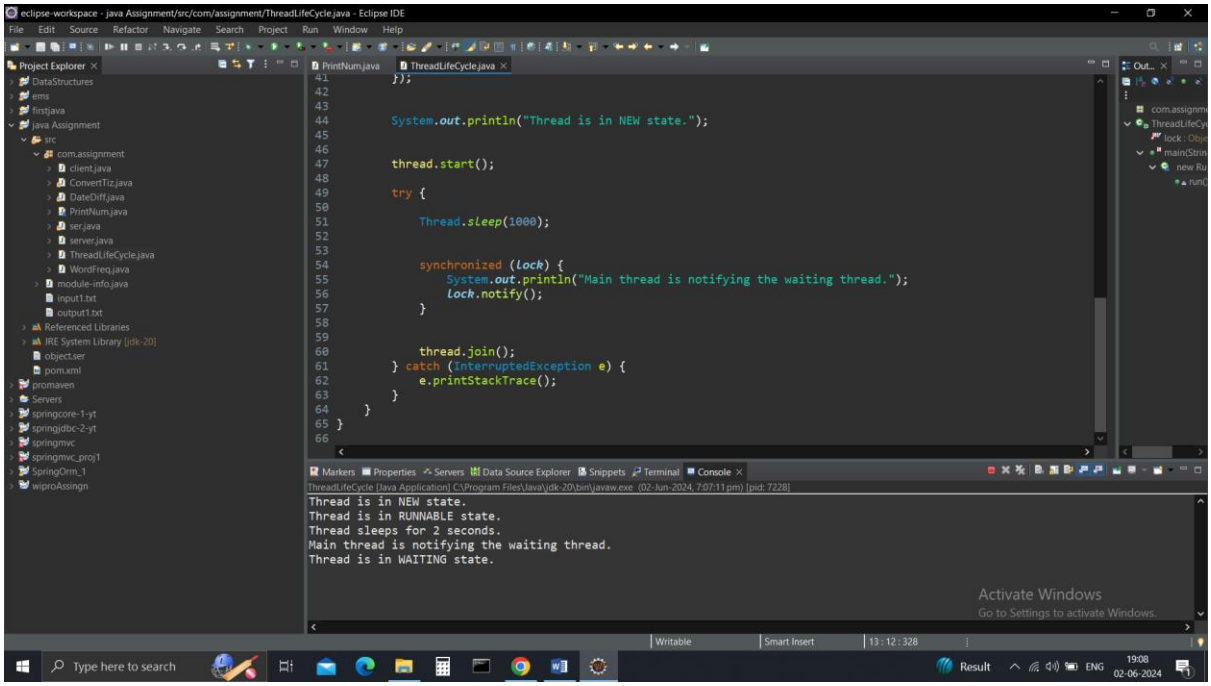


Task 2: States Transitions

Create a Java class that simulates a thread going through different lifecycle states: NEW, RUNNABLE, WAITING, TIMED WAITING, BLOCKED, and TERMINATED. Use methods like sleep(), wait(), notify(), and join() to demonstrate these states

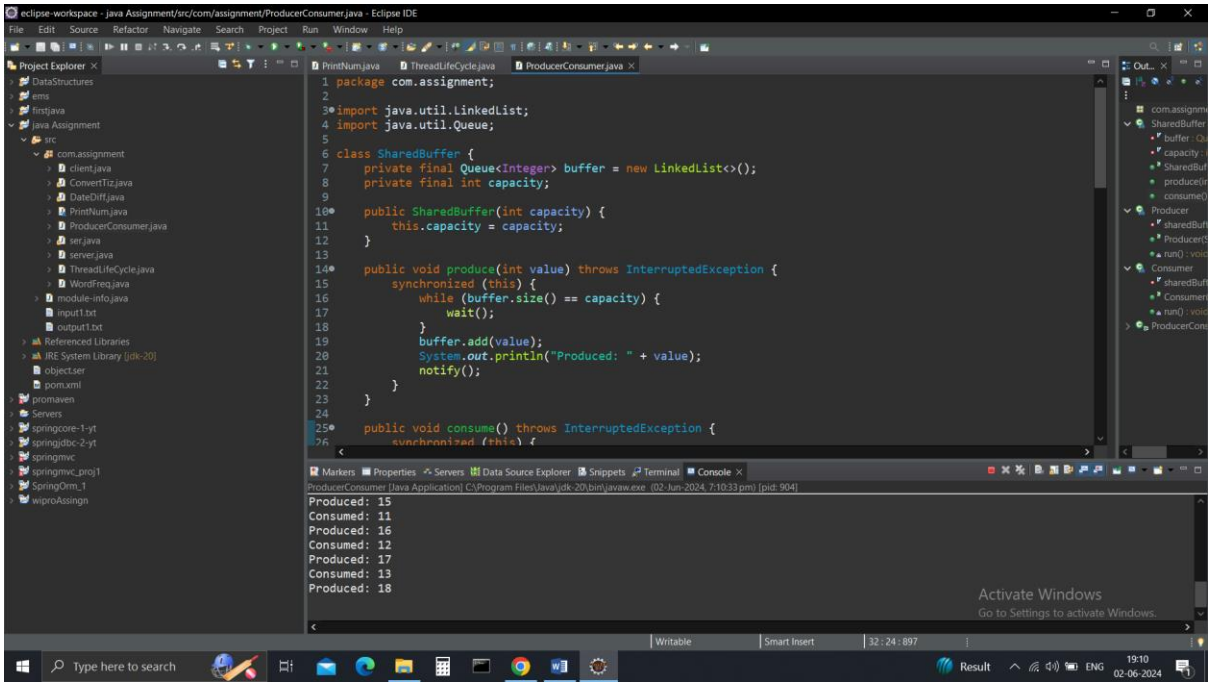


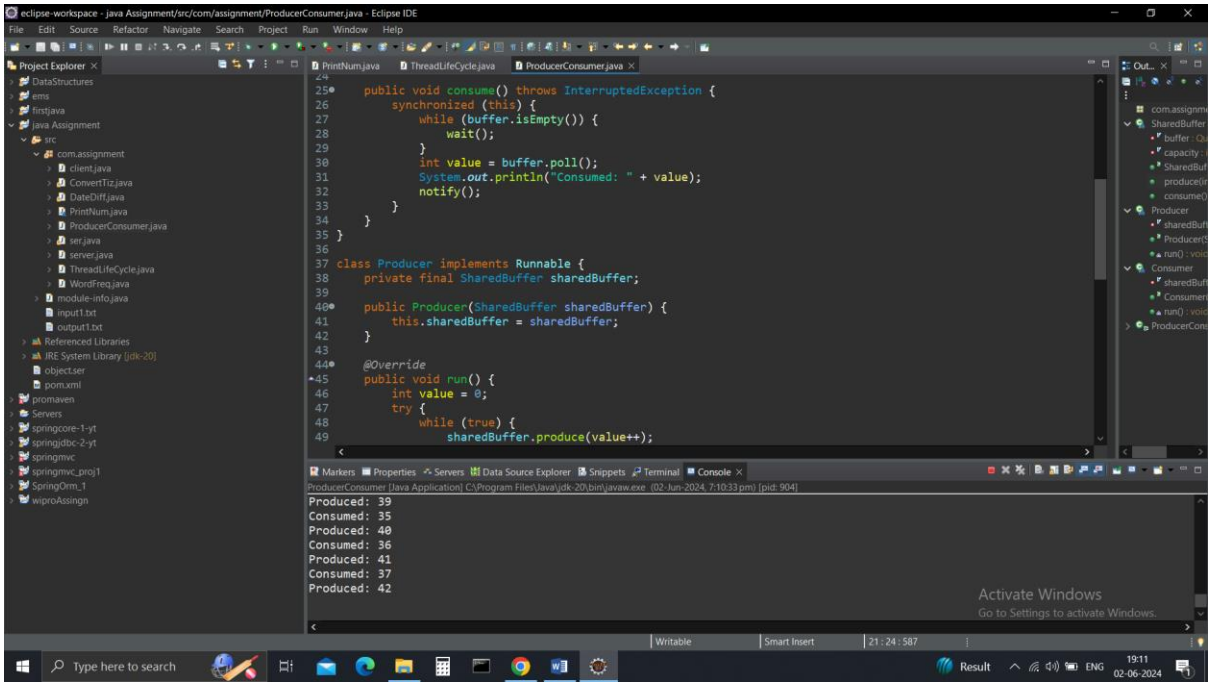




Task 3: Synchronization and Inter-thread Communication

Implement a producer-cons imer problem usit using wait() and notify() methods to handle the correct processing sequence between threads




eclipse-workspace - java Assignment/src/com/assignment/ProducerConsumer.java - Eclipse IDE
File Edit Source Refactor Navigate Search Project Run Window Help
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client.java
ConvertTiz.java
DateDiff.java
PrintNum.java
ProducerConsumer.java
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server.java
ThreadLifeCycle.java
WordFreq.java
module-info.java
input1.txt
output1.txt
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object.ser
pom.xml
promaven
Servers
springcore-1-yt
springjdbc-2-yt
springmvc
springmvc_proj1
SpringOrm_1
wiproAssingn
PrintNum.java
ThreadLifeCycle.java
ProducerConsumer.java
public void consume() throws InterruptedException {
synchronized (this) {
while (buffer.isEmpty()) {
wait();
}
int value = buffer.poll();
System.out.println("Consumed: " + value);
notify();
}
}
}
class Producer implements Runnable {
private final SharedBuffer sharedBuffer;
public Producer(SharedBuffer sharedBuffer) {
this.sharedBuffer = sharedBuffer;
}
@Override
public void run() {
int value = 0;
try {
while (true) {
sharedBuffer.produce(value++);
Markers Properties Servers Data Source Explorer Snippets Terminal Console
ProducerConsumer [Java Application] C:\Program Files\Java\jdk-20\bin\javaw.exe (02-Jun-2024, 7:10:33 pm) [pid: 904]
Produced: 39
Consumed: 35
Produced: 40
Consumed: 36
Produced: 41
Consumed: 37
Produced: 42
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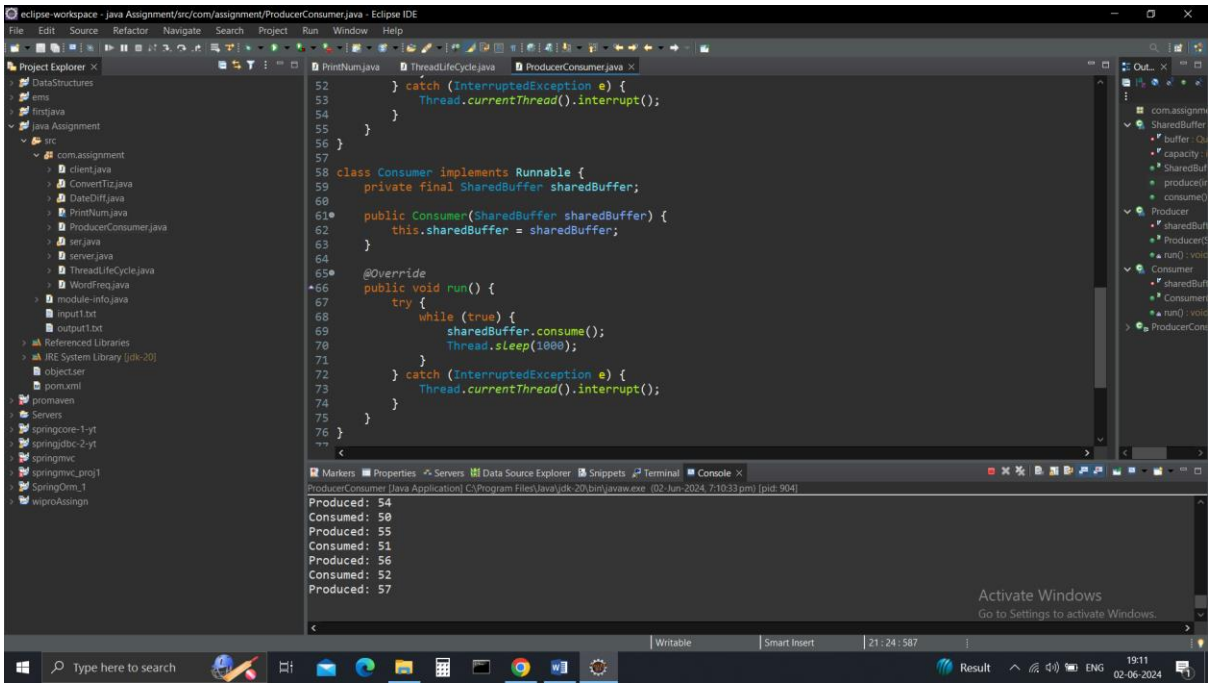
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client.java
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Servers
springcore-1-yt
springjdbc-2-yt
springmvc
springmvc_proj1
SpringOrm_1
wiproAssingn
PrintNum.java
ThreadLifeCycle.java
ProducerConsumer.java
} catch (InterruptedException e) {
Thread.currentThread().interrupt();
}
}
}
class Consumer implements Runnable {
private final SharedBuffer sharedBuffer;
public Consumer(SharedBuffer sharedBuffer) {
this.sharedBuffer = sharedBuffer;
}
@Override
public void run() {
try {
while (true) {
sharedBuffer.consume();
Thread.sleep(1000);
}
} catch (InterruptedException e) {
Thread.currentThread().interrupt();
}
}
}
Markers Properties Servers Data Source Explorer Snippets Terminal Console
ProducerConsumer [Java Application] C:\Program Files\Java\jdk-20\bin\javaw.exe (02-Jun-2024, 7:10:33 pm) [pid: 904]
Produced: 54
Consumed: 50
Produced: 55
Consumed: 51
Produced: 56
Consumed: 52
Produced: 57
Activate Windows
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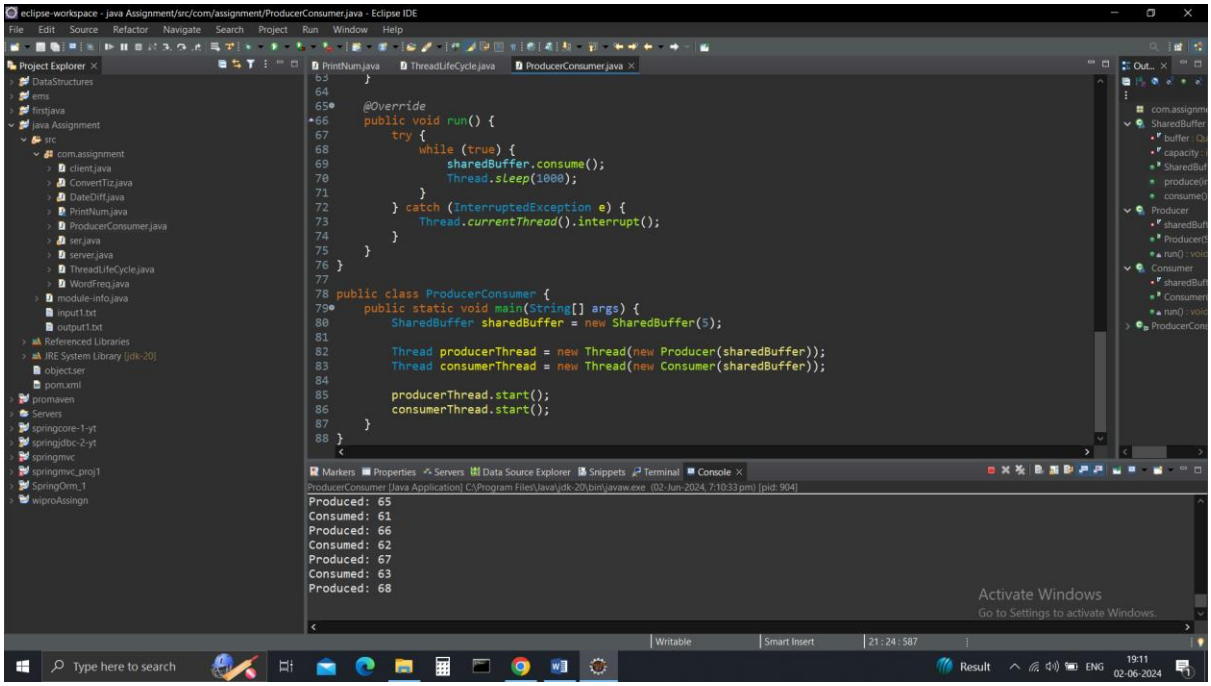
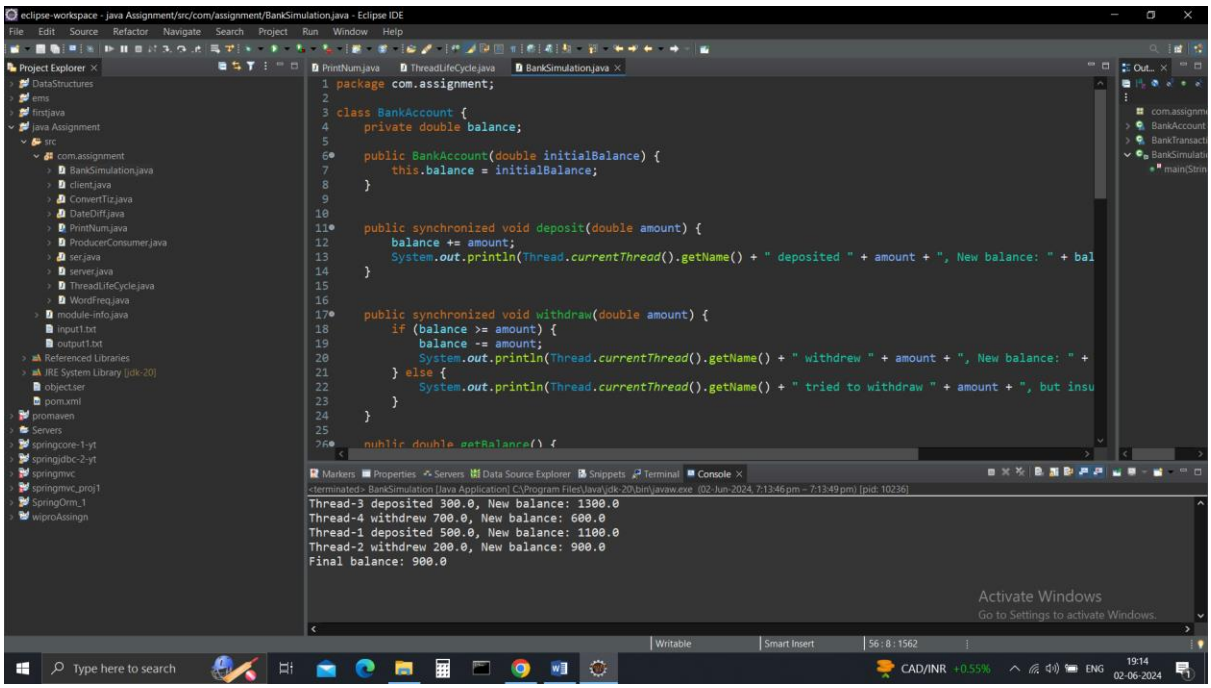
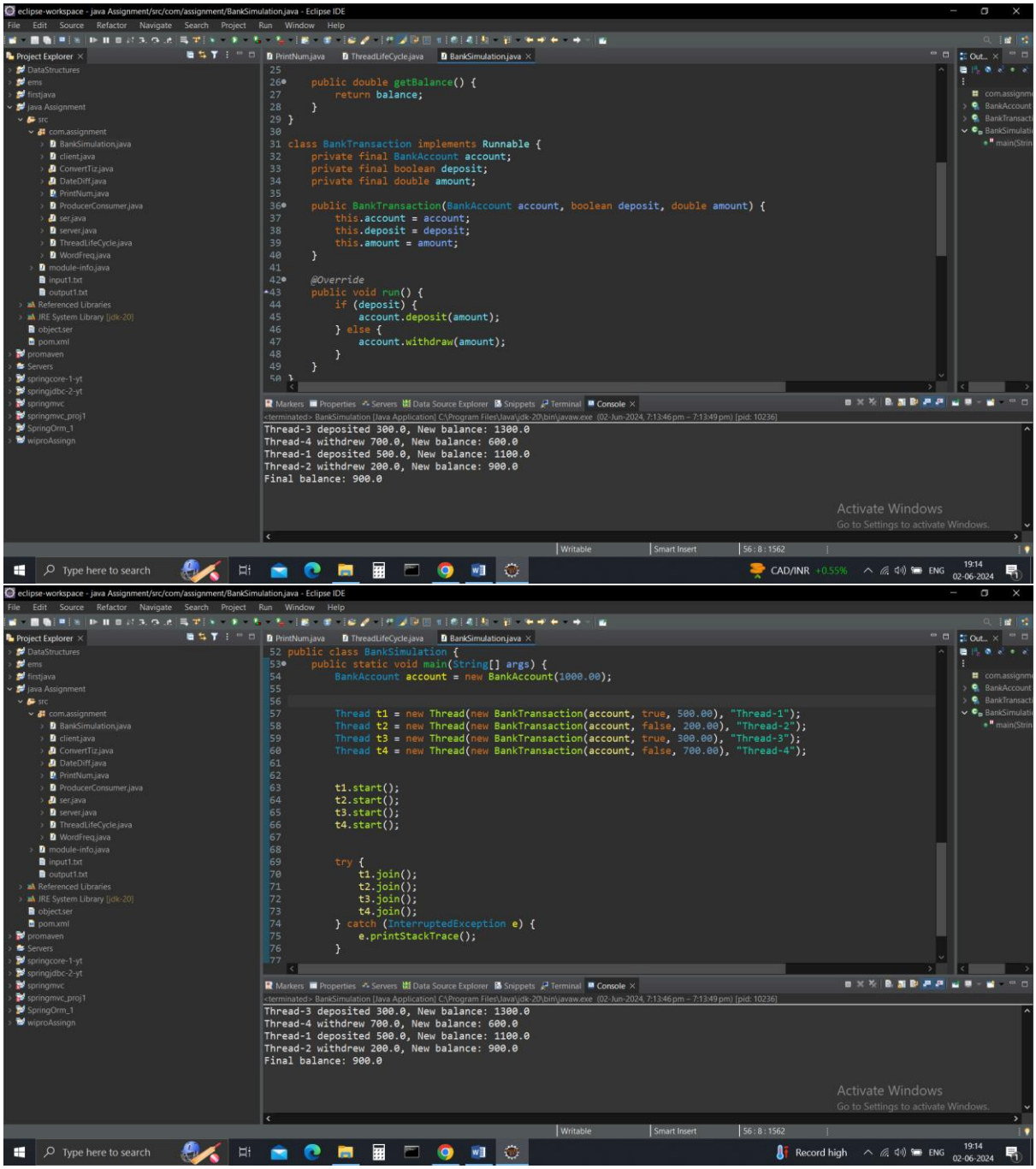


Task 4: Synchronized Blocks and Methods

Write a program that simulates a bank account being accessed by multiple threads to perform deposits and withdrawals using synchronized methods to prevent race conditions

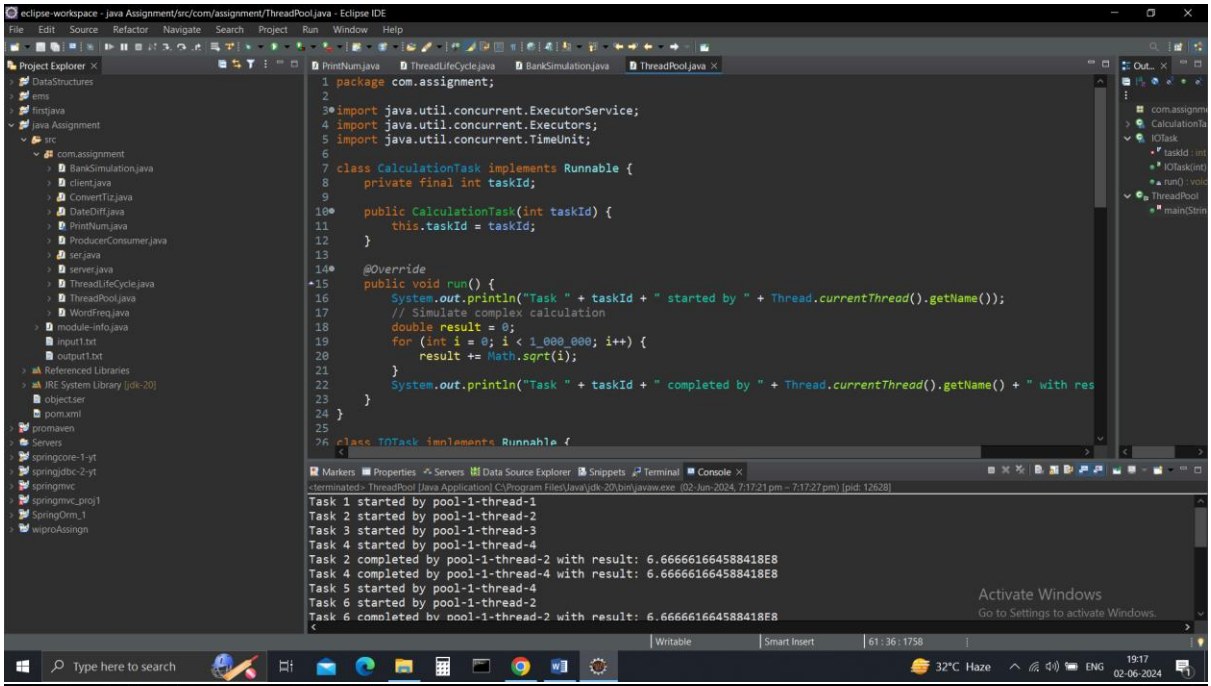




Task 5:

Thread Pools and Concurrency Utilities

Create a fixed-size thread pool and submit multiple tasks that perform complex calculations or VO operations and observe the execution.


eclipse-workspace - java Assignment/src/com/assignment/ThreadPool.java - Eclipse IDE
File Edit Source Refactor Navigate Search Project Run Window Help
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com.assignment
BankSimulation.java
client.java
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DateDiff.java
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server.java
ThreadLifeCycle.java
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module-info.java
input1.txt
output1.txt
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object.ser
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springjdbc-2-yt
springmvc
springmvc_proj1
SpringOrm_1
wiproAssingn
PrintNum.java
ThreadLifeCycle.java
BankSimulation.java
ThreadPool.java
1 package com.assignment;
2
3 import java.util.concurrent.ExecutorService;
4 import java.util.concurrent.Executors;
5 import java.util.concurrent.TimeUnit;
6
7 class CalculationTask implements Runnable {
8 private final int taskId;
9
10 public CalculationTask(int taskId) {
11 this.taskId = taskId;
12 }
13
14 @Override
15 public void run() {
16 System.out.println("Task " + taskId + " started by " + Thread.currentThread().getName());
17 // Simulate complex calculation
18 double result = 0;
19 for (int i = 0; i < 1_000_000; i++) {
20 result += Math.sqrt(i);
21 }
22 System.out.println("Task " + taskId + " completed by " + Thread.currentThread().getName() + " with res
23 }
24 }
25
26 class IOTask implements Runnable {
Markers Properties Servers Data Source Explorer Snippets Terminal Console
<terminated> ThreadPool [Java Application] C:\Program Files\Java\jdk-20\bin\javaw.exe (02-Jun-2024, 7:17:21 pm – 7:17:27 pm) [pid: 12628]
Task 1 started by pool-1-thread-1
Task 2 started by pool-1-thread-2
Task 3 started by pool-1-thread-3
Task 4 started by pool-1-thread-4
Task 2 completed by pool-1-thread-2 with result: 6.666661664588418E8
Task 4 completed by pool-1-thread-4 with result: 6.666661664588418E8
Task 5 started by pool-1-thread-4
Task 6 started by pool-1-thread-2
Task 6 completed by pool-1-thread-2 with result: 6.666661664588418E8
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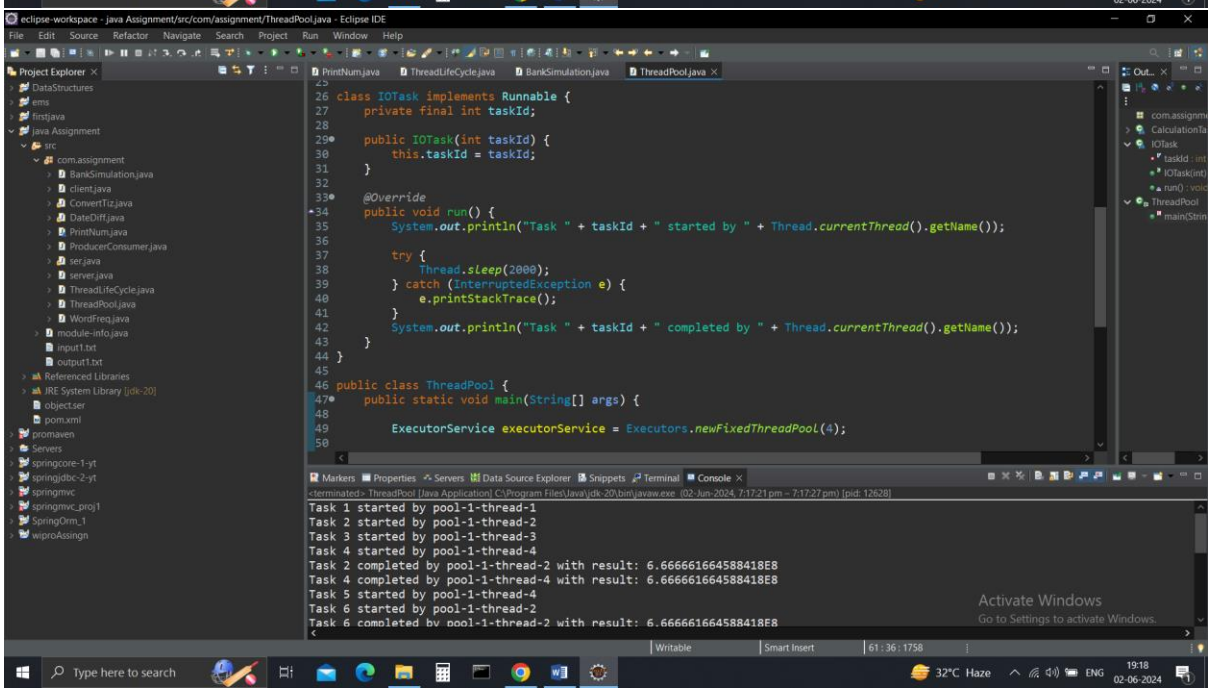
eclipse-workspace - java Assignment/src/com/assignment/ThreadPool.java - Eclipse IDE
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springmvc_proj1
SpringOrm_1
wiproAssingn
PrintNum.java
ThreadLifeCycle.java
BankSimulation.java
ThreadPool.java
26 class IOTask implements Runnable {
27 private final int taskId;
28
29 public IOTask(int taskId) {
30 this.taskId = taskId;
31 }
32
33 @Override
34 public void run() {
35 System.out.println("Task " + taskId + " started by " + Thread.currentThread().getName());
36
37 try {
38 Thread.sleep(2000);
39 } catch (InterruptedException e) {
40 e.printStackTrace();
41 }
42 System.out.println("Task " + taskId + " completed by " + Thread.currentThread().getName());
43 }
44 }
45
46 public class ThreadPool {
47 public static void main(String[] args) {
48
49 ExecutorService executorService = Executors.newFixedThreadPool(4);
50
Markers Properties Servers Data Source Explorer Snippets Terminal Console
<terminated> ThreadPool [Java Application] C:\Program Files\Java\jdk-20\bin\javaw.exe (02-Jun-2024, 7:17:21 pm – 7:17:27 pm) [pid: 12628]
Task 1 started by pool-1-thread-1
Task 2 started by pool-1-thread-2
Task 3 started by pool-1-thread-3
Task 4 started by pool-1-thread-4
Task 2 completed by pool-1-thread-2 with result: 6.666661664588418E8
Task 4 completed by pool-1-thread-4 with result: 6.666661664588418E8
Task 5 started by pool-1-thread-4
Task 6 started by pool-1-thread-2
Task 6 completed by pool-1-thread-2 with result: 6.666661664588418E8
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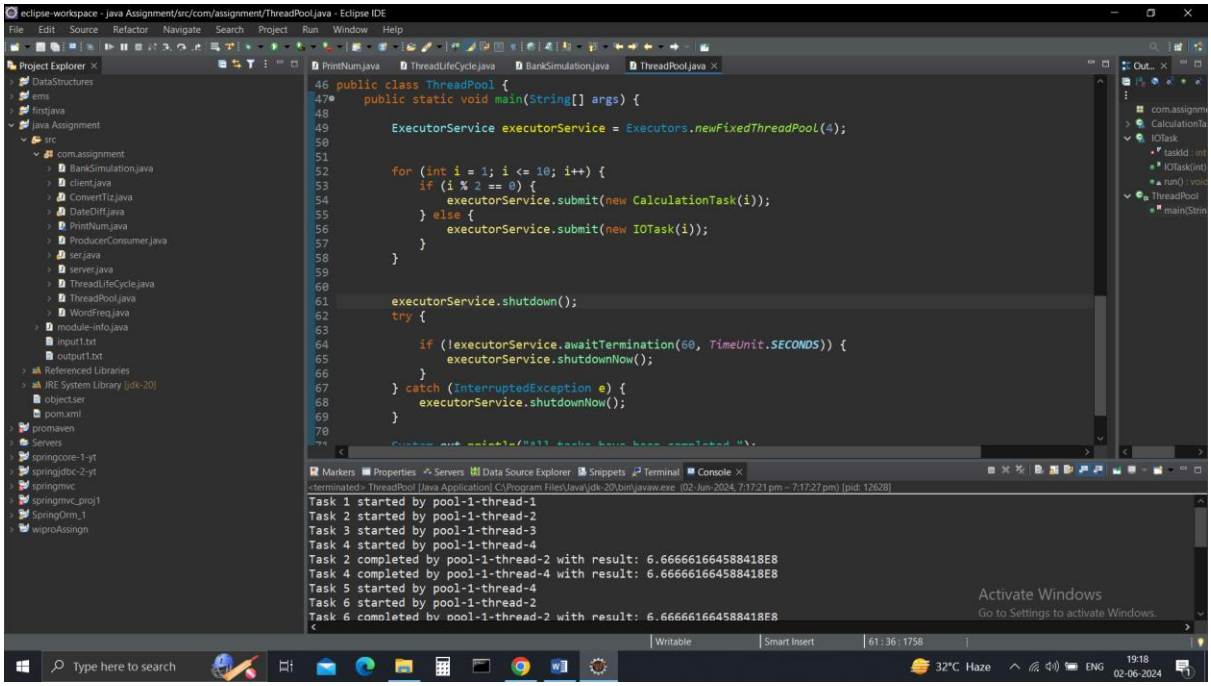
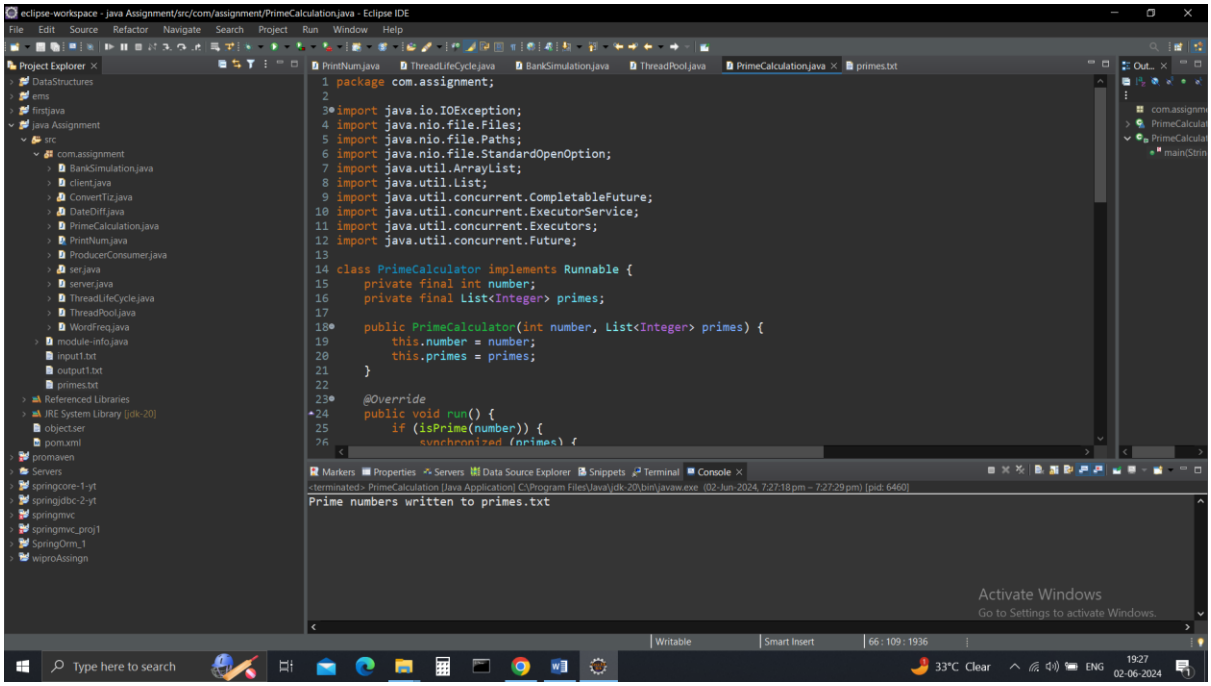
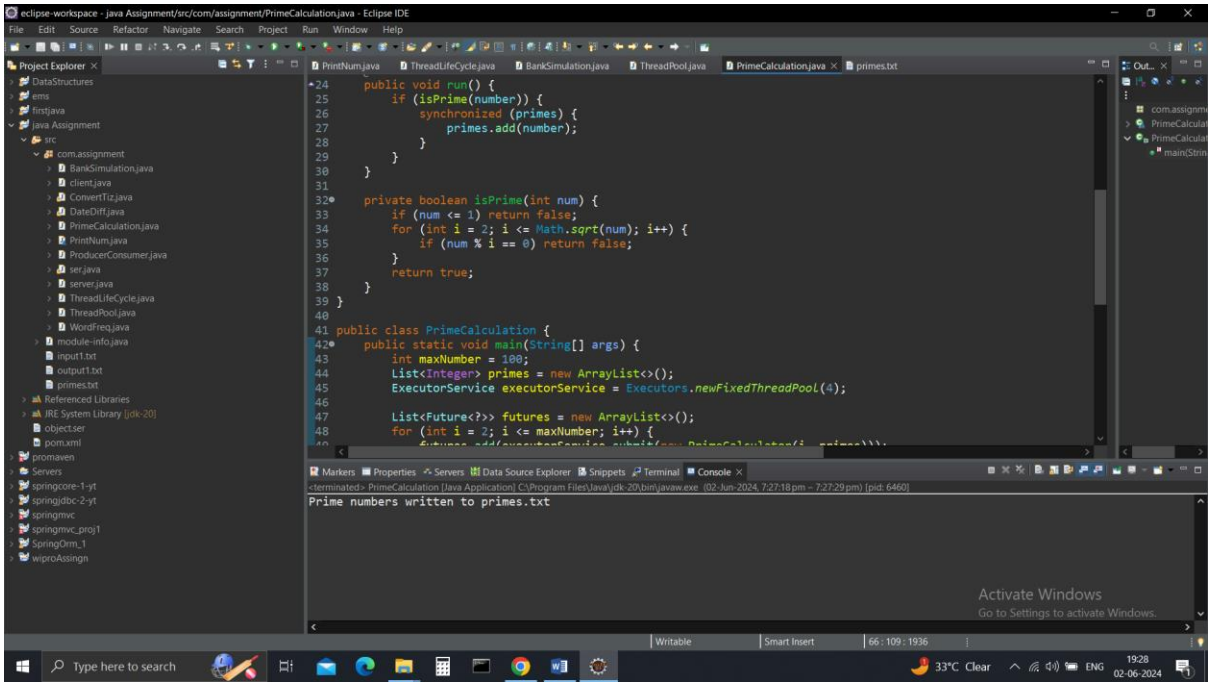


Task 6: ExecutorService to parallelize a task that calculates prime CompletableFuture to the results to a file asynchronously




eclipse-workspace - java Assignment/src/com/assignment/PrimeCalculation.java - Eclipse IDE
File Edit Source Refactor Navigate Search Project Run Window Help
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src
com.assignment
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WordFreq.java
module-info.java
input1.txt
output1.txt
primes.txt
Referenced Libraries
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promaven
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springjdbc-2-yt
springmvc
springmvc_proj1
SpringOrm_1
wiproAssingn
PrintNum.java
ThreadLifeCycle.java
BankSimulation.java
ThreadPool.java
PrimeCalculation.java
primes.txt
24 public void run() {
25 if (isPrime(number)) {
26 synchronized (primes) {
27 primes.add(number);
28 }
29 }
30 }
31
32 private boolean isPrime(int num) {
33 if (num <= 1) return false;
34 for (int i = 2; i <= Math.sqrt(num); i++) {
35 if (num % i == 0) return false;
36 }
37 return true;
38 }
39 }
40
41 public class PrimeCalculation {
42 public static void main(String[] args) {
43 int maxNumber = 100;
44 List<Integer> primes = new ArrayList<>();
45 ExecutorService executorService = Executors.newFixedThreadPool(4);
46
47 List<Future<?>> futures = new ArrayList<>();
48 for (int i = 2; i <= maxNumber; i++) {
Markers Properties Servers Data Source Explorer Snippets Terminal Console
<terminated> PrimeCalculation [Java Application] C:\Program Files\Java\jdk-20\bin\javaw.exe (02-Jun-2024, 7:27:18 pm – 7:27:29 pm) [pid: 6460]
Prime numbers written to primes.txt
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Go to Settings to activate Windows.
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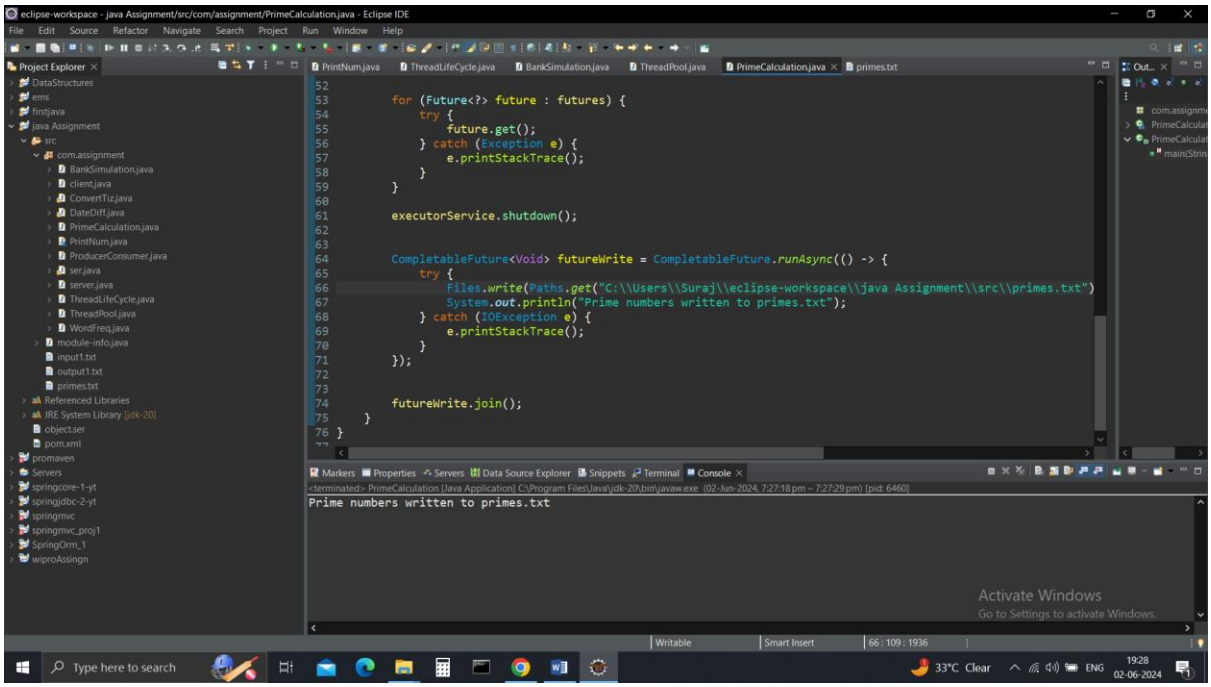
02-06-2024


eclipse-workspace - java Assignment/src/com/assignment/PrimeCalculation.java - Eclipse IDE
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wiproAssingn
PrintNum.java
ThreadLifeCycle.java
BankSimulation.java
ThreadPool.java
PrimeCalculation.java
primes.txt
52
53 for (Future<?> future : futures) {
54 try {
55 future.get();
56 } catch (Exception e) {
57 e.printStackTrace();
58 }
59 }
60
61 executorService.shutdown();
62
63
64 CompletableFuture<Void> futureWrite = CompletableFuture.runAsync(() -> {
65 try {
66 Files.write(Paths.get("C:\\Users\\Suraj\\eclipse-workspace\\java Assignment\\src\\primes.txt")
67 System.out.println("Prime numbers written to primes.txt");
68 } catch (IOException e) {
69 e.printStackTrace();
70 }
71 });
72
73
74 futureWrite.join();
75 }
76 }
Markers Properties Servers Data Source Explorer Snippets Terminal Console
<terminated> PrimeCalculation [Java Application] C:\Program Files\Java\jdk-20\bin\javaw.exe (02-Jun-2024, 7:27:18 pm – 7:27:29 pm) [pid: 6460]
Prime numbers written to primes.txt
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Go to Settings to activate Windows.
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Smart Insert
66 : 109 : 1936
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33°C Clear
ENG
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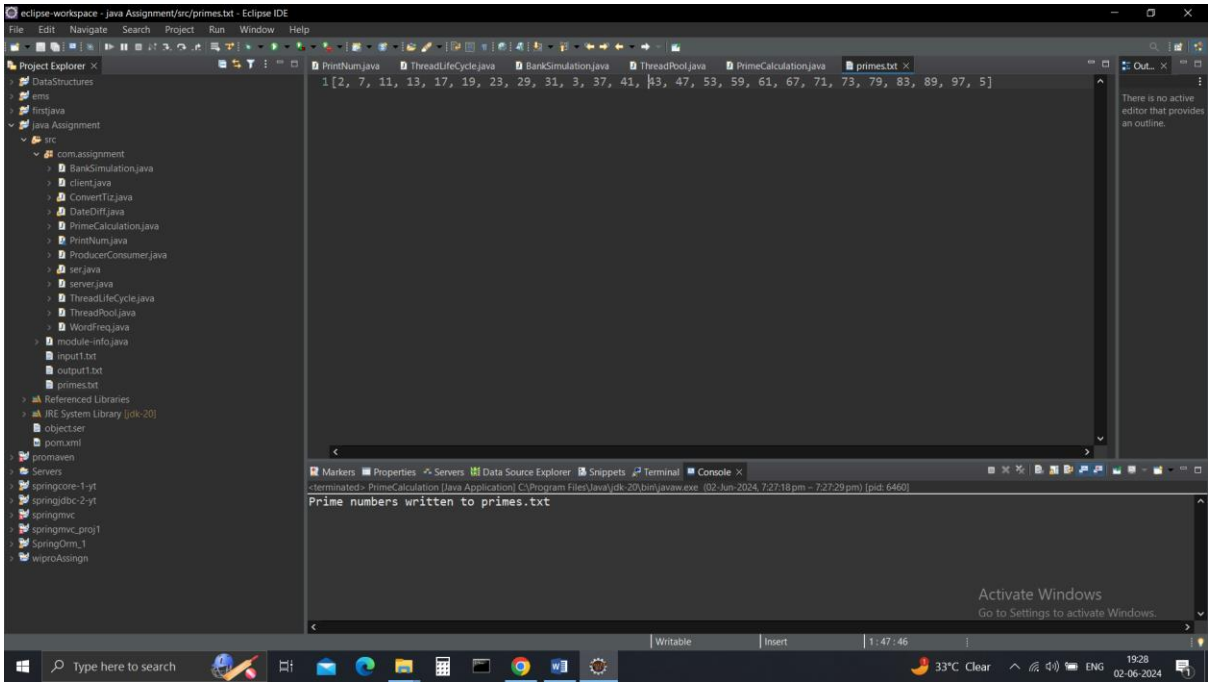
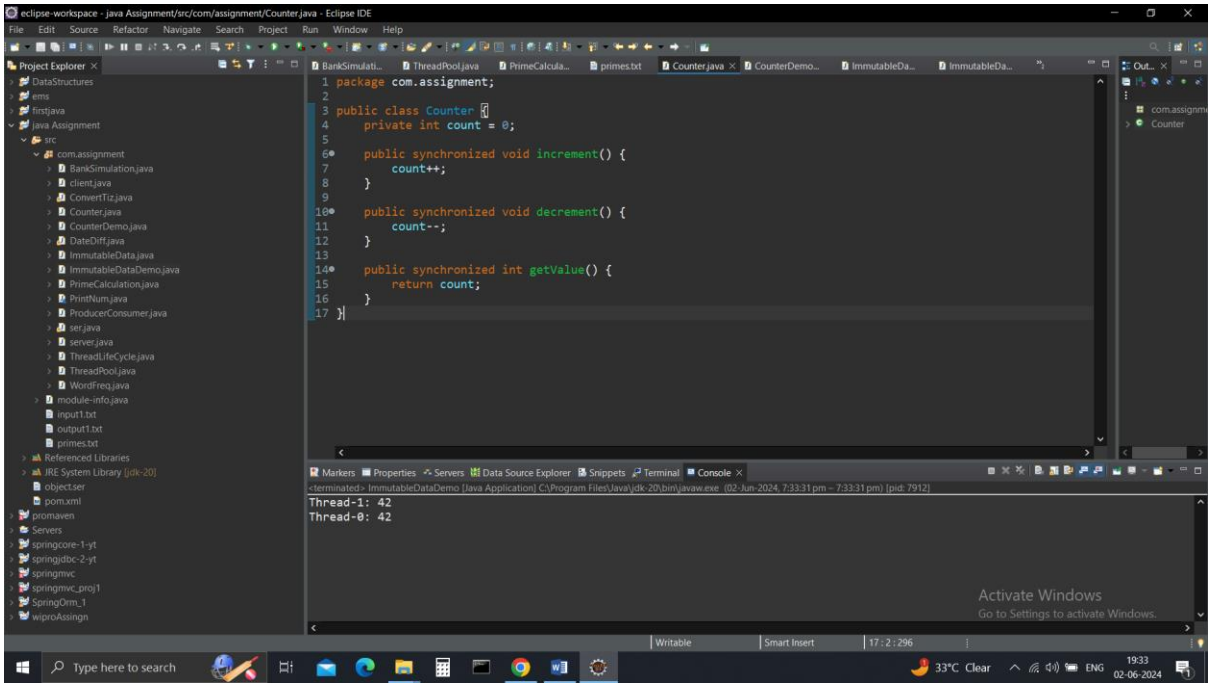
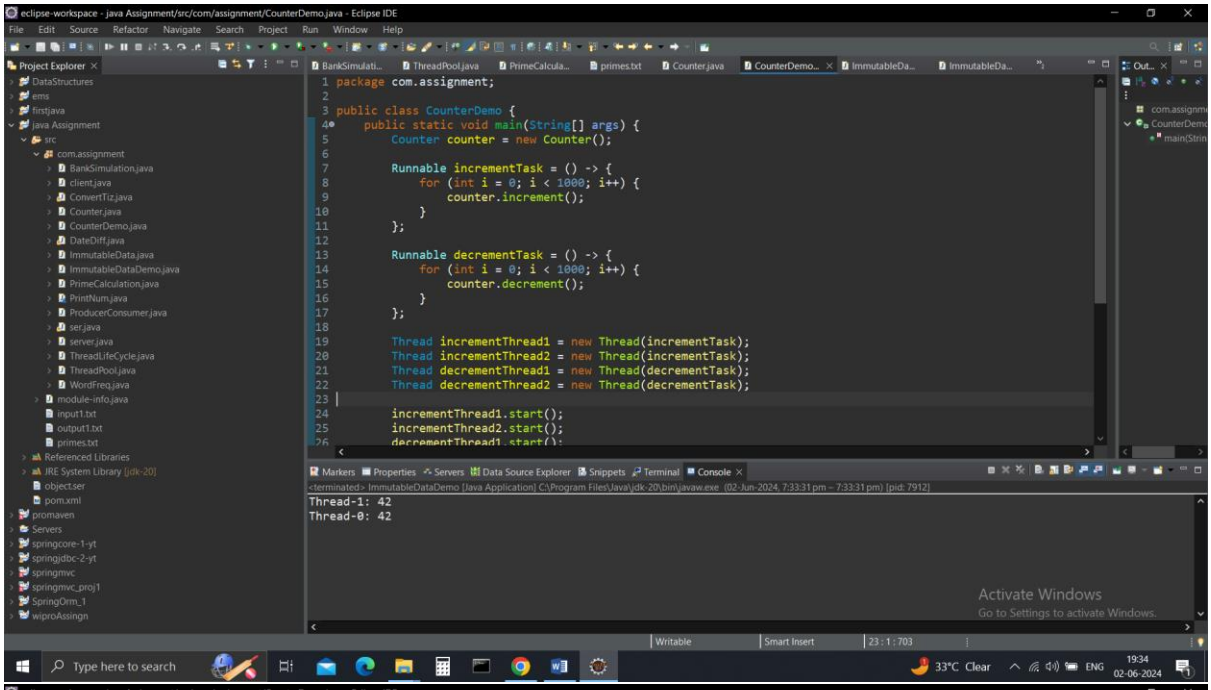


Task 7: Design a thread-safe Counter class with increment and decrement methods. Then demonstrate its usage from multiple threads. Also, implement and immutable class to share data between threads




eclipse-workspace - java Assignment/src/com/assignment/CounterDemo.java - Eclipse IDE
File Edit Source Refactor Navigate Search Project Run Window Help
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src
com.assignment
BankSimulation.java
client.java
ConvertTiz.java
Counter.java
CounterDemo.java
DateDiff.java
ImmutableData.java
ImmutableDataDemo.java
PrimeCalculation.java
PrintNum.java
ProducerConsumer.java
ser.java
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ThreadPool.java
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springjdbc-2-yt
springmvc
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SpringOrm_1
wiproAssingn
BankSimulati...
ThreadPool.java
PrimeCalcula...
primes.txt
Counter.java
CounterDemo...
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ImmutableDa...
1 package com.assignment;
2
3 public class CounterDemo {
4 public static void main(String[] args) {
5 Counter counter = new Counter();
6
7 Runnable incrementTask = () -> {
8 for (int i = 0; i < 1000; i++) {
9 counter.increment();
10 }
11 };
12
13 Runnable decrementTask = () -> {
14 for (int i = 0; i < 1000; i++) {
15 counter.decrement();
16 }
17 };
18
19 Thread incrementThread1 = new Thread(incrementTask);
20 Thread incrementThread2 = new Thread(incrementTask);
21 Thread decrementThread1 = new Thread(decrementTask);
22 Thread decrementThread2 = new Thread(decrementTask);
23
24 incrementThread1.start();
25 incrementThread2.start();
Markers Properties Servers Data Source Explorer Snippets Terminal Console
<terminated> ImmutableDataDemo [Java Application] C:\Program Files\Java\jdk-20\bin\javaw.exe (02-Jun-2024, 7:33:31 pm – 7:33:31 pm) [pid: 7912]
Thread-1: 42
Thread-0: 42
Activate Windows
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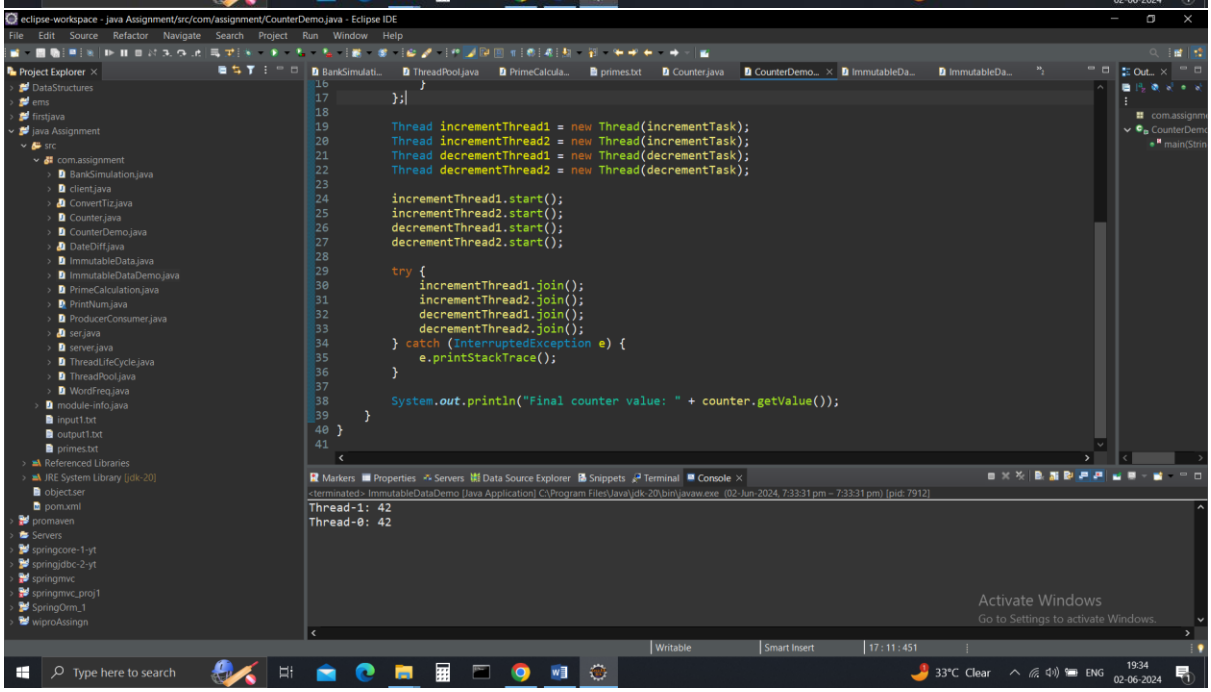
19:34
02-06-2024


eclipse-workspace - java Assignment/src/com/assignment/CounterDemo.java - Eclipse IDE
File Edit Source Refactor Navigate Search Project Run Window Help
Project Explorer
DataStructures
ems
firstjava
java Assignment
src
com.assignment
BankSimulation.java
client.java
ConvertTiz.java
Counter.java
CounterDemo.java
DateDiff.java
ImmutableData.java
ImmutableDataDemo.java
PrimeCalculation.java
PrintNum.java
ProducerConsumer.java
ser.java
server.java
ThreadLifeCycle.java
ThreadPool.java
WordFreq.java
module-info.java
input1.txt
output1.txt
primes.txt
Referenced Libraries
JRE System Library [jdk-20]
object.ser
pom.xml
promaven
Servers
springcore-1-yt
springjdbc-2-yt
springmvc
springmvc_proj1
SpringOrm_1
wiproAssingn
BankSimulati...
ThreadPool.java
PrimeCalcula...
primes.txt
Counter.java
CounterDemo...
ImmutableDa...
ImmutableDa...
16 }
17 };
18
19 Thread incrementThread1 = new Thread(incrementTask);
20 Thread incrementThread2 = new Thread(incrementTask);
21 Thread decrementThread1 = new Thread(decrementTask);
22 Thread decrementThread2 = new Thread(decrementTask);
23
24 incrementThread1.start();
25 incrementThread2.start();
26 decrementThread1.start();
27 decrementThread2.start();
28
29 try {
30 incrementThread1.join();
31 incrementThread2.join();
32 decrementThread1.join();
33 decrementThread2.join();
34 } catch (InterruptedException e) {
35 e.printStackTrace();
36 }
37
38 System.out.println("Final counter value: " + counter.getValue());
39 }
40 }
41
Markers Properties Servers Data Source Explorer Snippets Terminal Console
<terminated> ImmutableDataDemo [Java Application] C:\Program Files\Java\jdk-20\bin\javaw.exe (02-Jun-2024, 7:33:31 pm – 7:33:31 pm) [pid: 7912]
Thread-1: 42
Thread-0: 42
Activate Windows
Go to Settings to activate Windows.
Writable
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ENG
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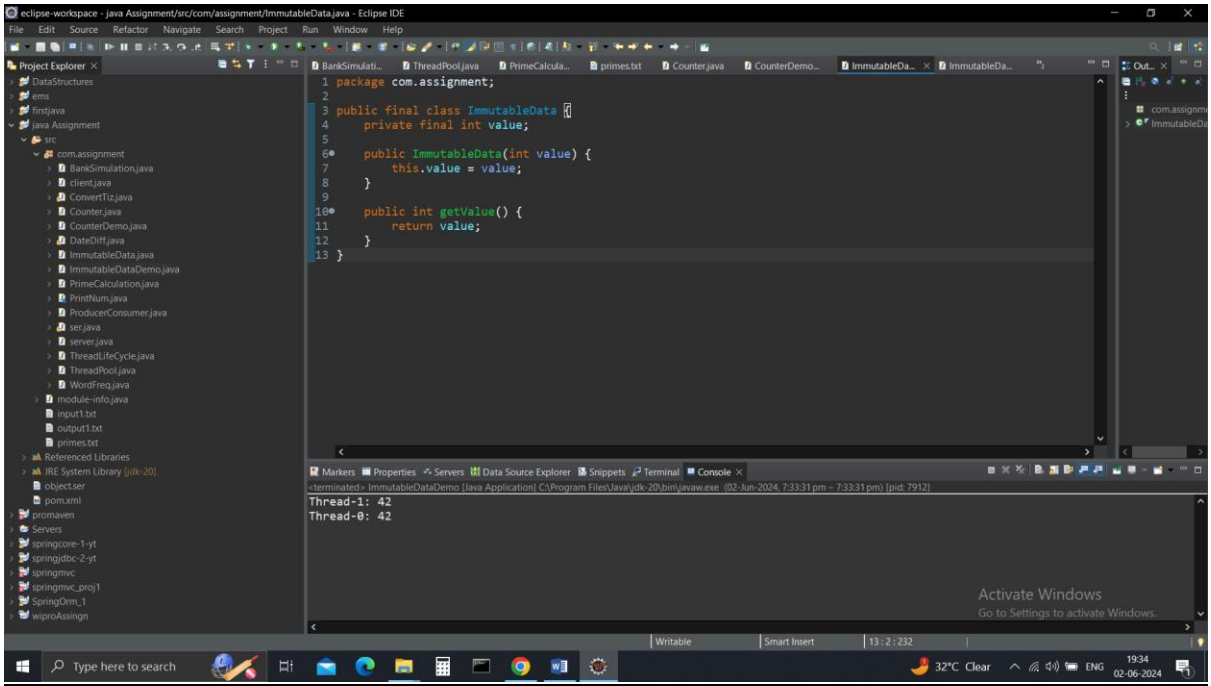
02-06-2024


eclipse-workspace - java Assignment/src/com/assignment/ImmutableData.java - Eclipse IDE
File Edit Source Refactor Navigate Search Project Run Window Help
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wiproAssingn
BankSimulati...
ThreadPool.java
PrimeCalcula...
primes.txt
Counter.java
CounterDemo...
ImmutableDa...
ImmutableDa...
1 package com.assignment;
2
3 public final class ImmutableData {
4 private final int value;
5
6 public ImmutableData(int value) {
7 this.value = value;
8 }
9
10 public int getValue() {
11 return value;
12 }
13 }
Markers Properties Servers Data Source Explorer Snippets Terminal Console
<terminated> ImmutableDataDemo [Java Application] C:\Program Files\Java\jdk-20\bin\javaw.exe (02-Jun-2024, 7:33:31 pm – 7:33:31 pm) [pid: 7912]
Thread-1: 42
Thread-0: 42
Activate Windows
Go to Settings to activate Windows.
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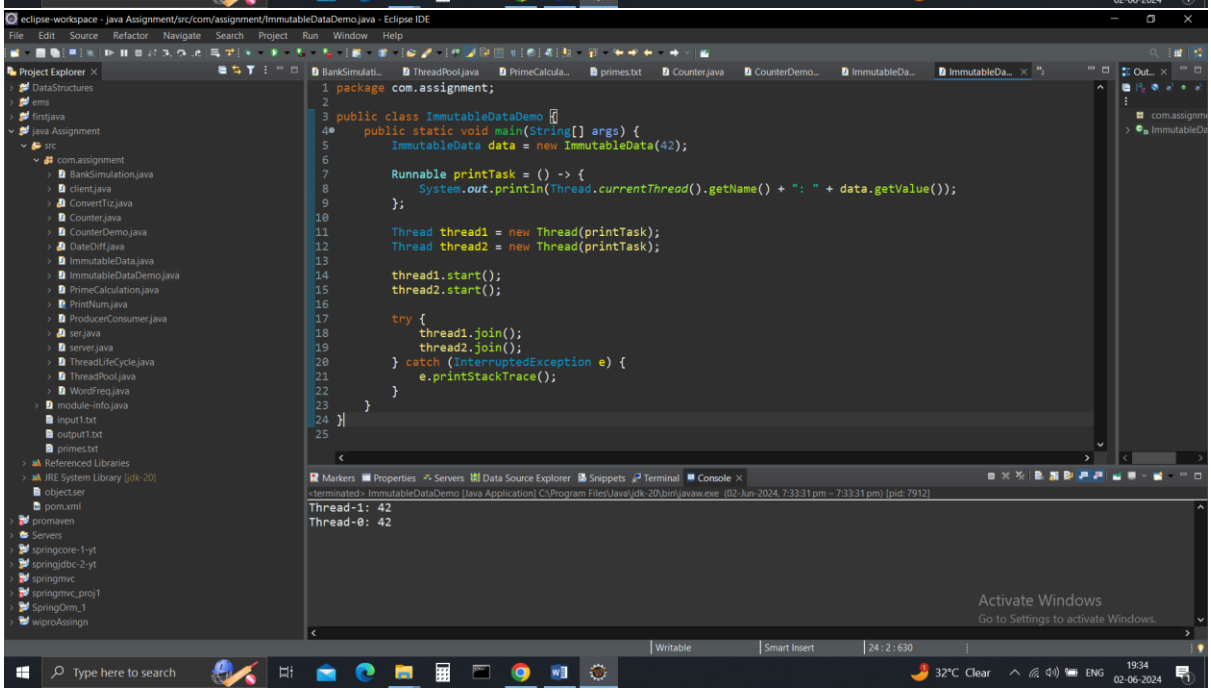
02-06-2024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wiproAssingn
BankSimulati...
ThreadPool.java
PrimeCalcula...
primes.txt
Counter.java
CounterDemo...
ImmutableDa...
ImmutableDa...
1 package com.assignment;
2
3 public class ImmutableDataDemo {
4 public static void main(String[] args) {
5 ImmutableData data = new ImmutableData(42);
6
7 Runnable printTask = () -> {
8 System.out.println(Thread.currentThread().getName() + ": " + data.getValue());
9 };
10
11 Thread thread1 = new Thread(printTask);
12 Thread thread2 = new Thread(printTask);
13
14 thread1.start();
15 thread2.start();
16
17 try {
18 thread1.join();
19 thread2.join();
20 } catch (InterruptedException e) {
21 e.printStackTrace();
22 }
23 }
24 }
25
Markers Properties Servers Data Source Explorer Snippets Terminal Console
<terminated> ImmutableDataDemo [Java Application] C:\Program Files\Java\jdk-20\bin\javaw.exe (02-Jun-2024, 7:33:31 pm – 7:33:31 pm) [pid: 7912]
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Thread-0: 42
Activate Windows
Go to Settings to activate Windows.
Writable
Smart Insert
24 : 2 : 630
Type here to search
32°C Clear
ENG
19:34
02-06-2024