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Program 2 Write-up

**Part1 output**

-->l Test2

threadOS: a new thread (thread=Thread[Thread-5,5,main] tid=1 pid=0)

threadOS: a new thread (thread=Thread[Thread-7,5,main] tid=2 pid=1)

threadOS: a new thread (thread=Thread[Thread-9,5,main] tid=3 pid=1)

threadOS: a new thread (thread=Thread[Thread-11,5,main] tid=4 pid=1)

threadOS: a new thread (thread=Thread[Thread-13,5,main] tid=5 pid=1)

threadOS: a new thread (thread=Thread[Thread-15,5,main] tid=6 pid=1)

Thread[e]: response time = 5997 turnaround time = 6497 execution time = 500

Thread[b]: response time = 2996 turnaround time = 9997 execution time = 7001

Thread[c]: response time = 3996 turnaround time = 20999 execution time = 17003

Thread[a]: response time = 1996 turnaround time = 28999 execution time = 27003

Thread[d]: response time = 4997 turnaround time = 33000 execution time = 28003

-->l Test2b

l Test2b

threadOS: a new thread (thread=Thread[Thread-5,5,main] tid=1 pid=0)

threadOS: a new thread (thread=Thread[Thread-7,5,main] tid=2 pid=1)

threadOS: a new thread (thread=Thread[Thread-9,5,main] tid=3 pid=1)

threadOS: a new thread (thread=Thread[Thread-11,5,main] tid=4 pid=1)

threadOS: a new thread (thread=Thread[Thread-13,5,main] tid=5 pid=1)

threadOS: a new thread (thread=Thread[Thread-15,5,main] tid=6 pid=1)

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[b] is running

Thread[b] is running

Thread[b] is running

Thread[b] is running

Thread[b] is running

Thread[b] is running

Thread[b] is running

Thread[b] is running

Thread[b] is running

Thread[b] is running

Thread[c] is running

Thread[c] is running

Thread[c] is running

Thread[c] is running

Thread[c] is running

Thread[c] is running

Thread[c] is running

Thread[c] is running

Thread[c] is running

Thread[c] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[e] is running

Thread[e] is running

Thread[e] is running

Thread[e] is running

Thread[e] is running

Thread[e]: response time = 5997 turnaround time = 6497 execution time = 500

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[b]: response time = 2996 turnaround time = 9997 execution time = 7001

Thread[c] is running

Thread[c] is running

Thread[c] is running

Thread[c] is running

Thread[c] is running

Thread[c] is running

Thread[c] is running

Thread[c] is running

Thread[c] is running

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Thread[d] is running

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Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[c]: response time = 3996 turnaround time = 20998 execution time = 17002

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

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Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[a]: response time = 1996 turnaround time = 29000 execution time = 27004

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d]: response time = 4996 turnaround time = 32999 execution time = 28003

Test2b finished

**Part2 output**

-->l Test2

l Test2

threadOS: a new thread (thread=Thread[Thread-5,5,main] tid=1 pid=0)

threadOS: a new thread (thread=Thread[Thread-7,5,main] tid=2 pid=1)

threadOS: a new thread (thread=Thread[Thread-9,5,main] tid=3 pid=1)

threadOS: a new thread (thread=Thread[Thread-11,5,main] tid=4 pid=1)

threadOS: a new thread (thread=Thread[Thread-13,5,main] tid=5 pid=1)

threadOS: a new thread (thread=Thread[Thread-15,5,main] tid=6 pid=1)

Thread[b]: response time = 994 turnaround time = 5496 execution time = 4502

Thread[e]: response time = 2495 turnaround time = 7996 execution time = 5501

Thread[c]: response time = 1495 turnaround time = 16499 execution time = 15004

Thread[a]: response time = 494 turnaround time = 24499 execution time = 24005

Thread[d]: response time = 1995 turnaround time = 31500 execution time = 29505

-->l Test2b

l Test2b

threadOS: a new thread (thread=Thread[Thread-5,5,main] tid=1 pid=0)

threadOS: a new thread (thread=Thread[Thread-7,5,main] tid=2 pid=1)

threadOS: a new thread (thread=Thread[Thread-9,5,main] tid=3 pid=1)

threadOS: a new thread (thread=Thread[Thread-11,5,main] tid=4 pid=1)

threadOS: a new thread (thread=Thread[Thread-13,5,main] tid=5 pid=1)

threadOS: a new thread (thread=Thread[Thread-15,5,main] tid=6 pid=1)

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[b] is running

Thread[b] is running

Thread[b] is running

Thread[b] is running

Thread[b] is running

Thread[c] is running

Thread[c] is running

Thread[c] is running

Thread[c] is running

Thread[c] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[e] is running

Thread[e] is running

Thread[e] is running

Thread[e] is running

Thread[e] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[b] is running

Thread[b] is running

Thread[b] is running

Thread[b] is running

Thread[b] is running

Thread[b]: response time = 995 turnaround time = 5497 execution time = 4502

Thread[c] is running

Thread[c] is running

Thread[c] is running

Thread[c] is running

Thread[c] is running

Thread[c] is running

Thread[c] is running

Thread[c] is running

Thread[c] is running

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Thread[d] is running

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Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[e]: response time = 2496 turnaround time = 7997 execution time = 5501

Thread[a] is running

Thread[a] is running

Thread[a] is running

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Thread[a] is running

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Thread[a] is running

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Thread[c] is running

Thread[c] is running

Thread[c] is running

Thread[c] is running

Thread[c] is running

Thread[c] is running

Thread[c] is running

Thread[c]: response time = 1496 turnaround time = 16500 execution time = 15004

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

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Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a] is running

Thread[a]: response time = 495 turnaround time = 24501 execution time = 24006

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

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Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d] is running

Thread[d]: response time = 1996 turnaround time = 31501 execution time = 29505

Test2b finished

**Part2 Algorithm:**

In Part2, I implemented a multi-level feedback queue scheduler. It consists of three queues labeled 0 to 2. Queue 0 is the highest priority, followed by queue1 and queue2. Queue 0 has a time quantum of 500 ms or half of the round robin’s scheduler’s time quantum. Queue 1 has a time quantum of 1000ms and Queue 2 has a quantum of 2000 ms. Initially all the threads are placed into Queue 0 in first come first served order. Then each thread is run for queue 0’s time quantum (500 ms). If the thread does not complete execution in that time, it is moved to queue1. After emptying queue0 the scheduler runs the threads in queue1 for the time quantum of 1000ms. In order to check for new threads coming in it runs for 500ms then checks queue 0 for any new threads. If queue0 contains new threads it will run those threads before resuming execution of the thread in q1. If the thread does not complete execution in queue1’s time quantum, it is moved to queue2. In queue2, each thread runs for a 2000ms time quantum checking for any new items in queue0 and queue1. If a thread does not finish execution in that time quantum it is pushed back to the end of the queue.

**Result Comparison:**

**Thread name CPU burst (in milliseconds)**

**Thread[a] 5000**

**Thread[b] 1000**

**Thread[c] 3000**

**Thread[d] 6000**

**Thread[e] 500**

**Part1(Round Robin)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Thread** | **response time (ms)** | **turn around time (ms)** | **execution time (ms)** |
| **a** | 1996 | 28999 | 27003 |
| **b** | 2996 | 9997 | 7001 |
| **c** | 3996 | 20999 | 17003 |
| **d** | 4997 | 33000 | 28003 |
| **e** | 5997 | 6497 | 500 |

**Part2(Multi level feedback queues)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Thread** | **response time (ms)** | **turn around time (ms)** | **execution time (ms)** |
| **a** | 494 | 24499 | 24005 |
| **b** | 994 | 5496 | 4502 |
| **c** | 1495 | 16499 | 15004 |
| **d** | 1995 | 31500 | 29505 |
| **e** | 2495 | 7996 | 5501 |

Overall it appears that my scheduler in part2 performed a bit worse than the round robin scheduler in part1. I suspect the reason behind this is that I did not check if a thread completes before the time quantum is over. This would probably result in some idle time in which no threads are running.

If Queue2 was run on a first come first served basis, the threads might complete a bit faster in this case since there wouldn’t be any time when a thread completes its execution in the middle of a quantum. However, if the burst times of programs in queue2 varied greatly, programs with shorter burst times might take a long time to continue their execution. With this round robin method, it favors programs with shorter burst times since they will have to run through less cycles through the queue to finish execution.