Assignment 2 – Process Scheduling and Memory Management

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Table of Contents

[Part 1 Concepts 3](#_Toc149140165)

[P1.a 3](#_Toc149140166)

[P1.b 3](#_Toc149140167)

[P1.b.i – FCFS 3](#_Toc149140168)

[P1.b.ii – Round Robin 4](#_Toc149140169)

[P1.b.iii – Multiple Queues with Feedback 4](#_Toc149140170)

[P1.d 4](#_Toc149140171)

[P1.e 4](#_Toc149140172)

[P1.e.a - FCFS 4](#_Toc149140173)

[P1.e.b - RR 4](#_Toc149140174)

[P1.e.c – Multi-level Feedback Queues 4](#_Toc149140175)

[P1.f 5](#_Toc149140176)

[Part 2 5](#_Toc149140177)

[P2.iii – Simulation Execution 5](#_Toc149140178)

[P2.iv – Memory Management 5](#_Toc149140179)

[Appendix A: Gantt Charts 5](#_Toc149140180)

# Part 1 Concepts

## P1.a

**What are the possible events that can make that process abandon the use of the CPU? Explain how the OS Kernel will react to these different events in detail. Consider the kind of scheduler the system is using.**

Event 1: Interrupt

When an interrupt is detected and the interrupt has priority, then the running process is moved to the READY state while the interrupt is serviced.

Since the CPU scheduler is using a Round Robin with Priorities algorithm, then this interrupt could be the timer interrupting the process when the set quantum is reached.

Then the CPU scheduler picks one process from the READY state, based on highest priority user, to be dispatched to the CPU.

Event 2: I/O Request

When a process makes an I/O request, it is moved to the WAITING state. Then the CPU scheduler picks one process from the READY state, based on highest priority user, to be dispatched to the CPU.

Event 3: Process completes.

When the process finishes executing it moves to the terminated state. This is done by invoking an exit system call. Then the CPU scheduler picks one process from the READY state, based on highest priority user, to be dispatched to the CPU.

## P1.b

We are assuming that the Gantt charts are not being marked. However, the Gantt charts have been included in the Appendix A.

The following were computed using the formula:

### P1.b.i – FCFS

Mean turnaround time = 29.6 seconds

### P1.b.ii – Round Robin

Mean turnaround time = 41.6 seconds

### P1.b.iii – Multiple Queues with Feedback

Mean turnaround time = 40.2 seconds

## P1.d

Coming soon …

## P1.e

**Explain, in general, the differences in the degree to which the following scheduling algorithms discriminate in favour of short processes.**

All algorithms are analyzed on a degree of 0 to 1, where 0 is not discriminatory in favour of short processes and 1 is very discriminatory in favour of short processes.

### P1.e.a - FCFS

FCFS does not discriminate in favour of short processes, thus we have assigned it a degree of 0.

### P1.e.b - RR

RR slightly discriminates in favour of short processes, thus we have assigned it a degree of 0.5.

When a process with CPU time that is longer than the quantum, the process will be kicked out of the CPU and be put at the back of the ready queue. This means long processes will need to re-enter the queue multiple times to run to completion, while short processes with a CPU time less than the quantum will run to completion when allocated to the CPU. We consider this favouring short processes. However, the algorithm is still fair because long processes will eventually run. Thus, we say it slightly discriminates in favour of short processes.

### P1.e.c – Multi-level Feedback Queues

MLFQ discriminates in favour of short processes, thus we have assigned it a degree of 1.

MLFQ is not fair because long processes will end up in the low priority queue and processes in the low priority queue may never run.

This algorithm heavily favours short processes (processes with a CPU run time less than the quantum of the highest priority queue) because they will always be assigned to the highest priority queue and always run to completion. Thus, we say this algorithm is very discriminatory in favour of short processes.

## P1.f

Coming soon …

# Part 2

## P2.iii – Simulation Execution

Coming soon …

## P2.iv – Memory Management

Coming soon …

# Appendix A: Gantt Charts

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Figure 1: Gantt chart of FCFS algorithm without I/O

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Figure 2: Gantt chart of Round Robin algorithm without I/O

A graph with text and numbers

Description automatically generated with medium confidence

Figure 3: Gantt chart of Multi-level Feedback Queue without I/O