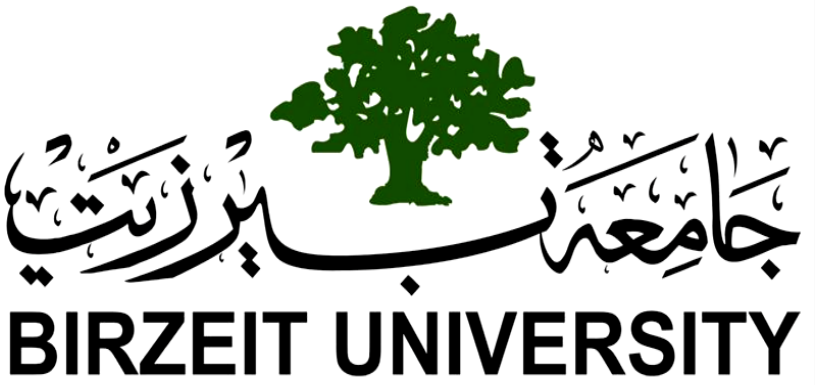

Faculty of Engineering & Technology Electrical & Computer Engineering Department

Circuits and Electronics Laboratory ENEE 2103

Course Project

Virtual Memory Management Simulation

Prepared by:

Hasan Hamed 1190496

Eyab Ghifari 1190999

Mohammad Faqih 1192217

Instructor: Dr. Ayman Hroub

Section: 3

Date: 8/1/2022

1. Abstract

The aim of the project is to simulate the virtual memory in computers using page replacement algorithms such as LRU and FIFO algorithms using the JAVA programming language, and to simulate the processes scheduling using Round Robin algorithm, and finally, to create an interface to see all of these operations clearly.

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2. Theory

In an operating system that uses paging for memory management, a page replacement algorithm is needed to decide which page needs to be replaced when new page comes in.

Page Fault – A page fault happens when a running program accesses a memory page that is mapped into the virtual address space, but not loaded in physical memory.

2.1. Page Replacement Algorithms

Since actual physical memory is much smaller than virtual memory, page faults happen. In case of page fault, Operating System might have to replace one of the existing pages with the newly needed page. Different page replacement algorithms suggest different ways to decide which page to replace. The target for all algorithms is to reduce the number of page faults.

2.1.1 First In First Out (FIFO)

This is the simplest page replacement algorithm. In this algorithm, the operating system keeps track of all pages in the memory in a queue, the oldest page is in the front of the queue. When a page needs to be replaced page in the front of the queue is selected for removal.

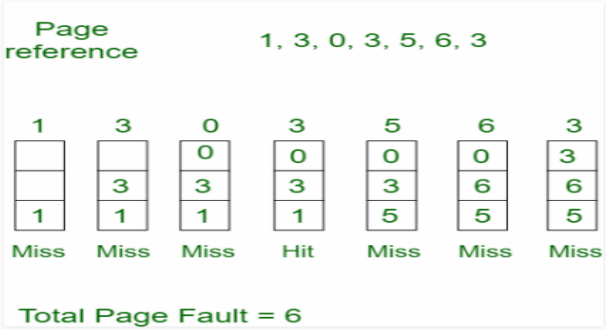

Figure 2.1: FIFO Page Replacement Algorithm.

2.1.2. Least Recently Used (LRU)

In this algorithm page will be replaced which is least recently used, this algorithm is better than FIFO but still it is not like optimal.

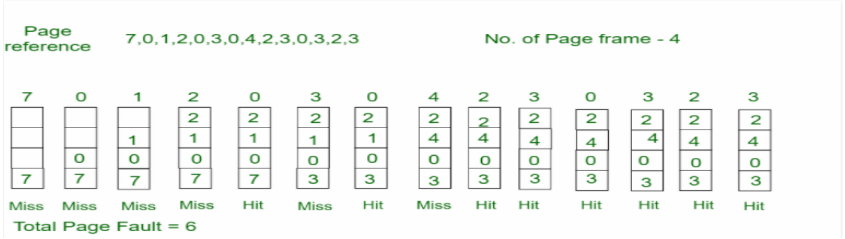

Figure 2.2: LRU Page Replacement Algorithm.

2.2. Round Robin Scheduling Algorithm

Round-robin (RR) is one of the algorithms employed by process and network schedulers in computing. As the term is generally used, time slices (also known as time quanta) are assigned to each process in equal portions and in circular order, handling all processes without priority (also known as cyclic executive). Round-robin scheduling is simple, easy to implement, and starvation-free. Round-robin scheduling can be applied to other scheduling problems, such as data packet scheduling in computer networks. It is an operating system concept.

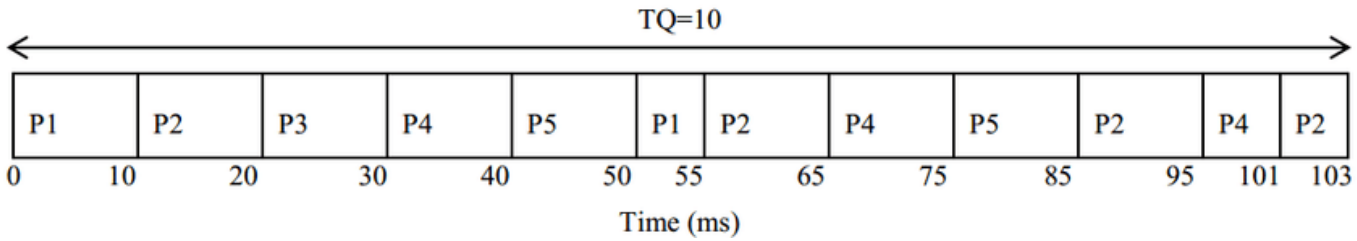

Figure 2.3: Round Robin.

3. Program Results

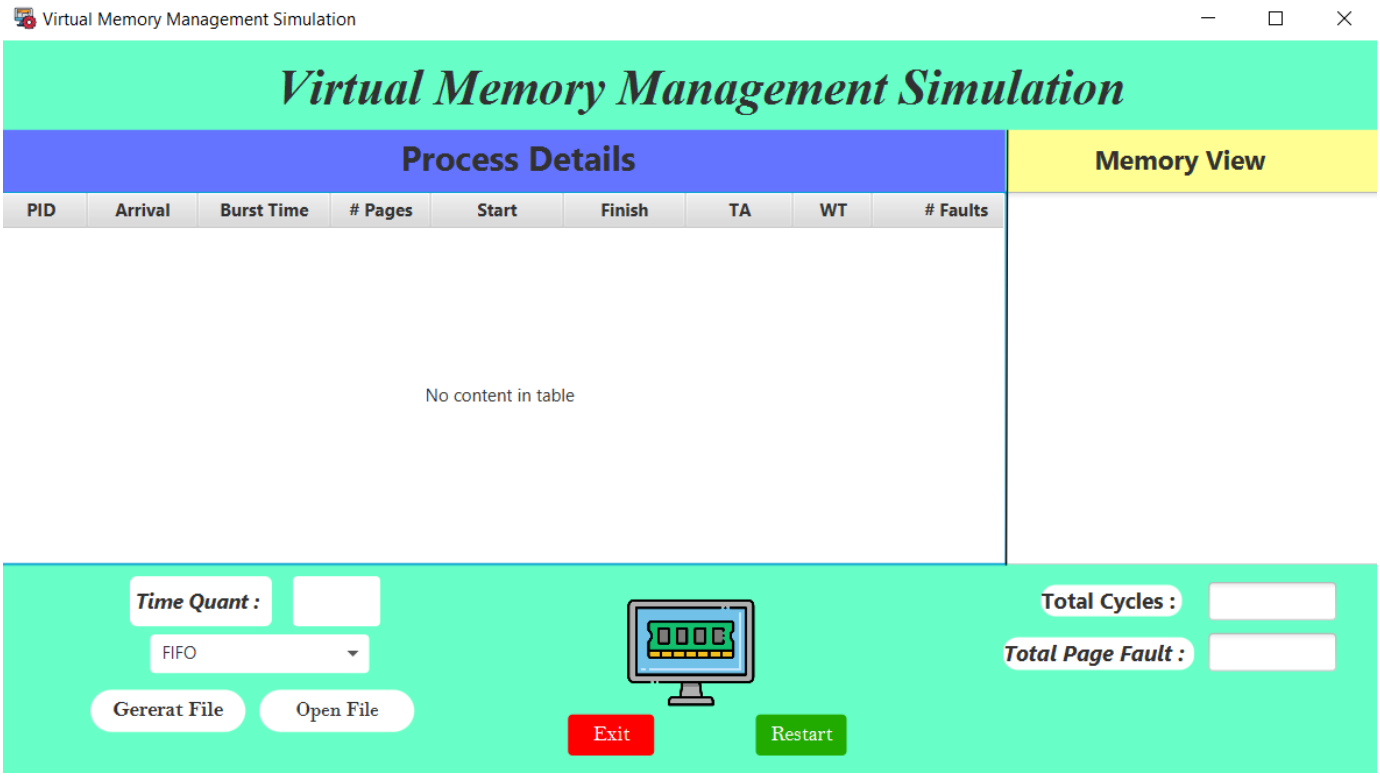

Figure 3.1: Program Interface.

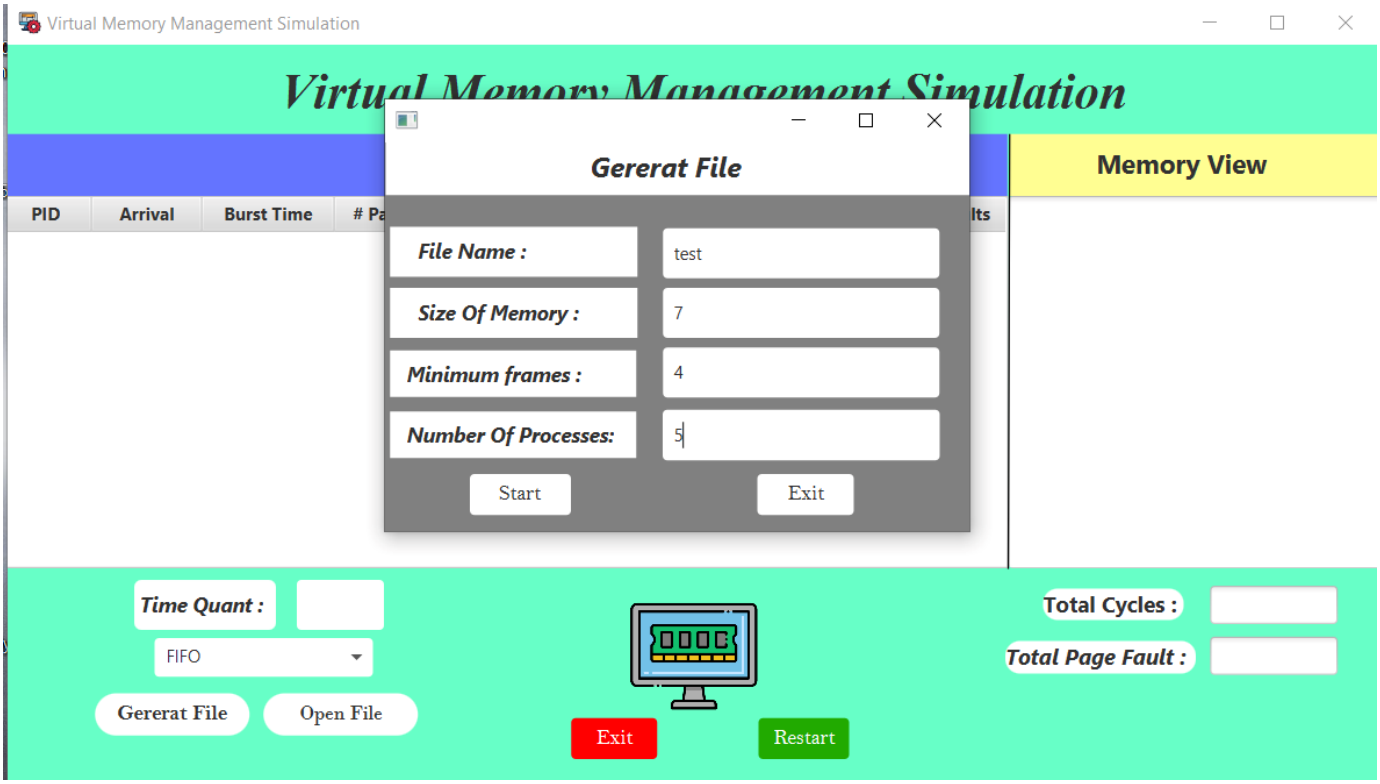

Figure 3.2: Configuration File Generator.

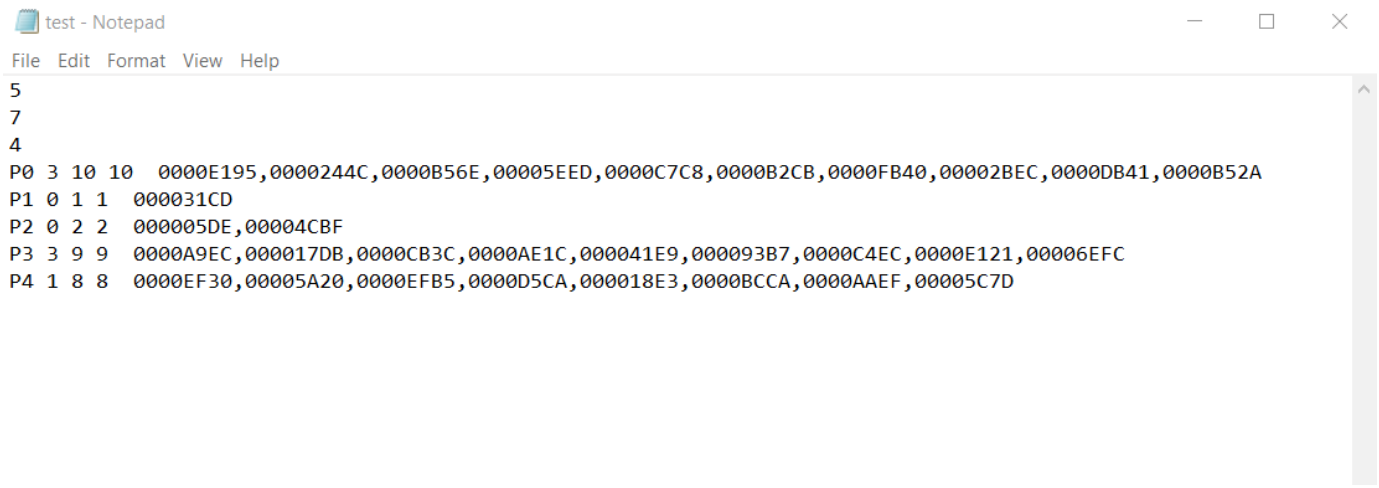

Figure 3.3: Configuration File Format.

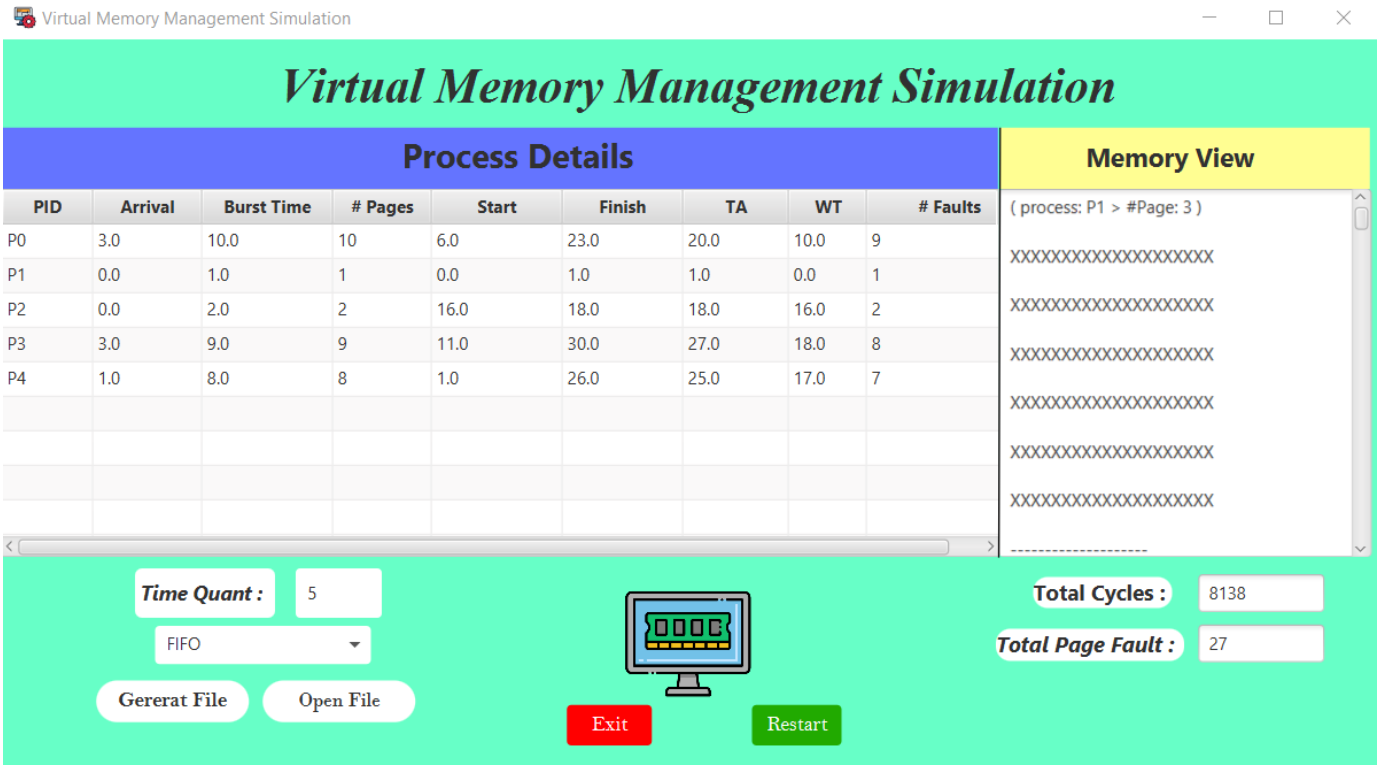

Figure 3.4: Test Case #1.

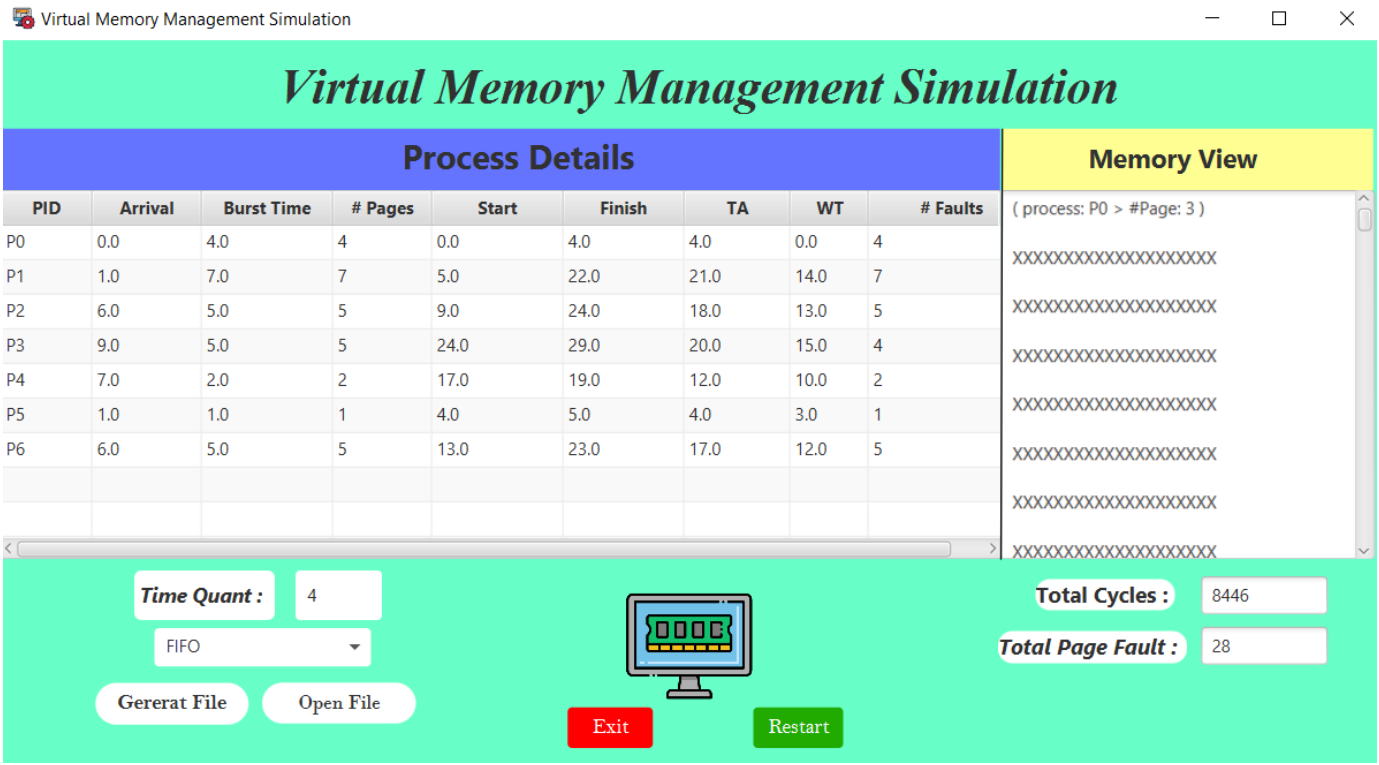

Figure 3.5: Test Case #2.

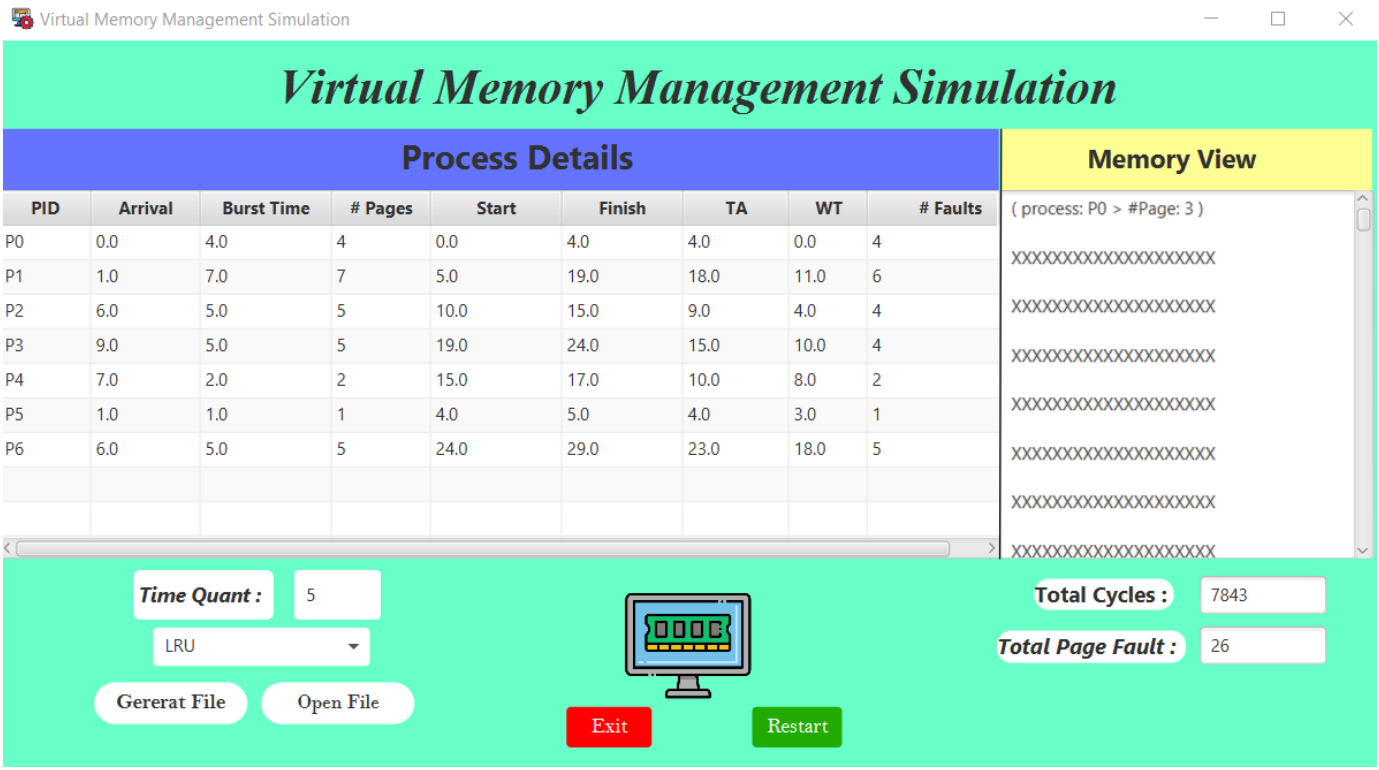

Figure 3.6: Test Case #3.

4. Conclusion

In this project, the simulator was used to see how the virtual memory and paging replacements works in operating systems and how the LRU and FIFO algorithms differs in the number of page faults and the way of implementation, and the bonus scheduling part shows how the Round Robin algorithm works to assign the processes to the CPU.

The program was showed in a simple interface menu that shows everything required on the project description.

The thread part is missed in this project because we didn’t know how to implement it because it is something new and it seems hard.

5. References

[1]https://www.geeksforgeeks.org/page-replacement-algorithms-in-operating-systems/
[2] https://en.wikipedia.org/wiki/Round-robin_scheduling