FCFS CPU scheduler Code and Report

**Project objective:** To learn more about OS CPU scheduling through a hands-on simulation programming experience. To simulate, compare, and evaluate CPU scheduling algorithms using a consistent set of data.

Names:

Reynaldo Williams

Katie Dao

Date:

March 9, 2021

Language used:

C++

1. Provide clear instructions on how to compile, build, and run the simulator (this will indicate that the application has been tested and works on the engineering student desktop)

Launch **Video Studio**

* Click **Create New Product**.
* Select **Console App**.
* Click **Next**.
* Enter pertinent information to start project (Name, Location, Etc.)
* Click **Create**
* Copy source code from text file and paste in .cpp file (override all previous text)
* Build project (Build Menu -> Build [Name]).
* Run project (Debug Menu -> Start Without Debugging).

1. Introduction

This program was meant to model the FCFS CPU scheduling algorithm to demonstrate a complete understanding of various scheduling algorithm like FCFS. This program was developed in C++ using structs and other various data structures and concepts to organize and properly process data. The expected results of this scheduling algorithm were those represented in the completed Gantt chart and my understanding of the FCFS algorithm. The program seemed to be straightforward, but I encountered a host of issues that were a result of my failure to make reasonable considerations. I had issues making sure that after every run information was accurate and properly processed but eventually, I was able to work through them with the use of online resources like GeeksforGeeks and the C++ STL library which gave me an insightful understanding of things I was previously unsure of with C++.

1. **Insert one table** that includes the entire simulation results for CPU Utilization, Response Time (RT) , Waiting Time (WT), Turnaround Time (TT) **PER PROCESS and Averages f**or both FCFS( 710 time units) and SJF (810 time units)

|  |  |  |  |
| --- | --- | --- | --- |
| **Process (FCFS Results)** | **RT (Response Time)** | **WT (Wait Time)** | **TT (Turnaround Time)** |
| P1 | 0 | 298 | 583 |
| P2 | 6 | 233 | 647 |
| P3 | 25 | 249 | 512 |
| P4 | 37 | 231 | 657 |
| P5 | 48 | 298 | 620 |
| P6 | 64 | 243 | 599 |
| P7 | 84 | 315 | 710 |
| P8 | 87 | 341 | 684 |
| **AVG** | **43.875** | **276** | **626.5** |
| **CPU Utilization** | **95.3521%** | | |
| **SJF (FCFS Results)** | **RT (Response Time)** | **WT (Wait Time)** | **TT (Turnaround Time)** |
| P1 | 3 | 65 | 350 |
| P2 | 104 | 230 | 644 |
| P3 | 20 | 117 | 380 |
| P4 | 9 | 79 | 505 |
| P5 | 79 | 216 | 538 |
| P6 | 431 | 454 | 810 |
| P7 | 0 | 60 | 455 |
| P8 | 41 | 121 | 464 |
| **AVG** | **85.875** | **167.75** | **518.25** |
| **CPU Utilization** | **82.35%** | | |

1. Answer the following questions in full sentences with a brief explanation, IN YOUR OWN WORDS:
   1. Which algorithm (FCFS or SJF) has the best (highest) CPU utilization, why do you think that algorithm has a higher CPU utilization?

FCFS has the best CPU utilization. I think that this algorithm has higher CPU utilization because there are less context switches as is no preemption.

* 1. How many context switches are in the simulation of FCFS?

There are 71 context switches in the simulation of FCFS.

* 1. How many context switches are in the simulation of SJF?

There are 76 context switches in the simulation of SJF.

* 1. How does the number of context switches effect the performance of the algorithm?

More context switches negatively affect the performance of the algorithm as context switch time is pure overhead and thus the system does not do any useful work.

* 1. Which algorithm (FCFS or SJF) has the lowest average waiting time?

The algorithm with the lowest average waiting time is SJF.

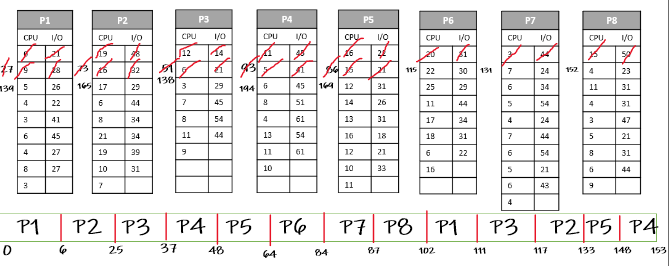
* 1. Which algorithm (FCFS or SJF) has the lowest average response time?

The algorithm with the lowest average response time is FCFS.

* 1. Which algorithm (FCFS or SJF) has the lowest average turnaround time?

The algorithm with the lowest average turnaround time is SJF.

1. Insert a partial or complete Gantt chart for FCFS.



1. Insert the calculated results that were produced by the simulation.

Finished

Total Time: 710

CPU Utilization: 95.3521%

Waiting Times P1 P2 P3 P4 P5 P6 P7 P8

298 227 224 194 250 179 231 254

Average Waiting: 232.125

Turnaround Times P1 P2 P3 P4 P5 P6 P7 P8

583 641 487 620 572 535 626 597

Average Turnaround: 582.625

Response Times P1 P2 P3 P4 P5 P6 P7 P8

0 6 25 37 48 64 84 87

Average Response: 43.875

1. Insert the FCFS Program Output. (**Be mindful that spacing and tabbing is a bit off**)

Current Time: 0

Now running: P1

------------------------------------------------------------------------

Ready Queue: Process Burst

P2 19

P3 12

P4 11

P5 16

P6 20

P7 3

P8 15

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

[empty]

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 6

Now running: P2

------------------------------------------------------------------------

Ready Queue: Process Burst

P3 12

P4 11

P5 16

P6 20

P7 3

P8 15

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P1 21

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 25

Now running: P3

------------------------------------------------------------------------

Ready Queue: Process Burst

P4 11

P5 16

P6 20

P7 3

P8 15

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P1 2

P2 48

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 37

Now running: P4

------------------------------------------------------------------------

Ready Queue: Process Burst

P1 9

P5 16

P6 20

P7 3

P8 15

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P2 36

P3 14

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 48

Now running: P5

------------------------------------------------------------------------

Ready Queue: Process Burst

P1 9

P6 20

P7 3

P8 15

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P2 25

P3 3

P4 45

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 64

Now running: P6

------------------------------------------------------------------------

Ready Queue: Process Burst

P1 9

P3 6

P7 3

P8 15

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P2 9

P4 29

P5 22

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 84

Now running: P7

------------------------------------------------------------------------

Ready Queue: Process Burst

P1 9

P2 16

P3 6

P8 15

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P4 9

P5 2

P6 31

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 87

Now running: P8

------------------------------------------------------------------------

Ready Queue: Process Burst

P1 9

P2 16

P3 6

P5 15

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P4 6

P6 28

P7 44

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 102

Now running: P1

------------------------------------------------------------------------

Ready Queue: Process Burst

P2 16

P3 6

P4 5

P5 15

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P6 13

P7 29

P8 50

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 111

Now running: P3

------------------------------------------------------------------------

Ready Queue: Process Burst

P2 16

P4 5

P5 15

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P6 4

P7 20

P8 41

P1 28

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 117

Now running: P2

------------------------------------------------------------------------

Ready Queue: Process Burst

P4 5

P5 15

P6 22

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P7 14

P8 35

P1 22

P3 21

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 133

Now running: P5

------------------------------------------------------------------------

Ready Queue: Process Burst

P4 5

P6 22

P7 7

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P8 19

P1 6

P3 5

P2 32

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 148

Now running: P4

------------------------------------------------------------------------

Ready Queue: Process Burst

P1 5

P3 3

P6 22

P7 7

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P8 4

P2 17

P5 21

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 153

Now running: P6

------------------------------------------------------------------------

Ready Queue: Process Burst

P1 5

P3 3

P7 7

P8 4

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P2 12

P5 16

P4 41

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 175

Now running: P7

------------------------------------------------------------------------

Ready Queue: Process Burst

P1 5

P2 17

P3 3

P5 12

P8 4

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P4 19

P6 30

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 182

Now running: P3

------------------------------------------------------------------------

Ready Queue: Process Burst

P1 5

P2 17

P5 12

P8 4

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P4 12

P6 23

P7 24

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 185

Now running: P1

------------------------------------------------------------------------

Ready Queue: Process Burst

P2 17

P5 12

P8 4

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P4 9

P6 20

P7 21

P3 29

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 190

Now running: P8

------------------------------------------------------------------------

Ready Queue: Process Burst

P2 17

P5 12

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P4 4

P6 15

P7 16

P3 24

P1 26

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 194

Now running: P2

------------------------------------------------------------------------

Ready Queue: Process Burst

P4 6

P5 12

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P6 11

P7 12

P3 20

P1 22

P8 23

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 211

Now running: P5

------------------------------------------------------------------------

Ready Queue: Process Burst

P4 6

P6 25

P7 6

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P3 3

P1 5

P8 6

P2 29

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 223

Now running: P4

------------------------------------------------------------------------

Ready Queue: Process Burst

P1 4

P3 7

P6 25

P7 6

P8 11

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P2 17

P5 31

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 229

Now running: P6

------------------------------------------------------------------------

Ready Queue: Process Burst

P1 4

P3 7

P7 6

P8 11

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P2 11

P5 25

P4 45

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 254

Now running: P7

------------------------------------------------------------------------

Ready Queue: Process Burst

P1 4

P2 6

P3 7

P5 14

P8 11

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P4 20

P6 29

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 260

Now running: P3

------------------------------------------------------------------------

Ready Queue: Process Burst

P1 4

P2 6

P5 14

P8 11

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P4 14

P6 23

P7 34

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 267

Now running: P1

------------------------------------------------------------------------

Ready Queue: Process Burst

P2 6

P5 14

P8 11

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P4 7

P6 16

P7 27

P3 45

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 271

Now running: P8

------------------------------------------------------------------------

Ready Queue: Process Burst

P2 6

P5 14

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P4 3

P6 12

P7 23

P3 41

P1 22

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 282

Now running: P2

------------------------------------------------------------------------

Ready Queue: Process Burst

P4 8

P5 14

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P6 1

P7 12

P3 30

P1 11

P8 31

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 288

Now running: P5

------------------------------------------------------------------------

Ready Queue: Process Burst

P4 8

P6 11

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P7 6

P3 24

P1 5

P8 25

P2 44

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 302

Now running: P4

------------------------------------------------------------------------

Ready Queue: Process Burst

P1 3

P6 11

P7 5

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P3 10

P8 11

P2 30

P5 26

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 310

Now running: P6

------------------------------------------------------------------------

Ready Queue: Process Burst

P1 3

P7 5

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P3 2

P8 3

P2 22

P5 18

P4 51

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 321

Now running: P1

------------------------------------------------------------------------

Ready Queue: Process Burst

P3 8

P7 5

P8 4

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P2 11

P5 7

P4 40

P6 44

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 324

Now running: P7

------------------------------------------------------------------------

Ready Queue: Process Burst

P3 8

P8 4

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P2 8

P5 4

P4 37

P6 41

P1 41

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 329

Now running: P3

------------------------------------------------------------------------

Ready Queue: Process Burst

P5 13

P8 4

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P2 3

P4 32

P6 36

P1 36

P7 54

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 337

Now running: P8

------------------------------------------------------------------------

Ready Queue: Process Burst

P2 8

P5 13

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P4 24

P6 28

P1 28

P7 46

P3 54

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 341

Now running: P5

------------------------------------------------------------------------

Ready Queue: Process Burst

P2 8

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P4 20

P6 24

P1 24

P7 42

P3 50

P8 31

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 354

Now running: P2

------------------------------------------------------------------------

Ready Queue: Process Burst

[empty]

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P4 7

P6 11

P1 11

P7 29

P3 37

P8 18

P5 31

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 362

Now running: P4

------------------------------------------------------------------------

Ready Queue: Process Burst

[empty]

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P6 3

P1 3

P7 21

P3 29

P8 10

P5 23

P2 34

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 366

Now running: P1

------------------------------------------------------------------------

Ready Queue: Process Burst

P6 17

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P7 17

P3 25

P8 6

P5 19

P2 30

P4 61

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 372

Now running: P6

------------------------------------------------------------------------

Ready Queue: Process Burst

P8 3

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P7 11

P3 19

P5 13

P2 24

P4 55

P1 45

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 389

Now running: P8

------------------------------------------------------------------------

Ready Queue: Process Burst

P5 16

P7 4

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P3 2

P2 7

P4 38

P1 28

P6 34

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 392

Now running: P7

------------------------------------------------------------------------

Ready Queue: Process Burst

P3 11

P5 16

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P2 4

P4 35

P1 25

P6 31

P8 47

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 396

Now running: P5

------------------------------------------------------------------------

Ready Queue: Process Burst

P2 21

P3 11

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P4 31

P1 21

P6 27

P8 43

P7 24

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 412

Now running: P3

------------------------------------------------------------------------

Ready Queue: Process Burst

P2 21

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P4 15

P1 5

P6 11

P8 27

P7 8

P5 18

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 423

Now running: P2

------------------------------------------------------------------------

Ready Queue: Process Burst

P1 4

P6 18

P7 7

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P4 4

P8 16

P5 7

P3 44

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 444

Now running: P1

------------------------------------------------------------------------

Ready Queue: Process Burst

P4 13

P5 12

P6 18

P7 7

P8 5

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P3 23

P2 34

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 448

Now running: P7

------------------------------------------------------------------------

Ready Queue: Process Burst

P4 13

P5 12

P6 18

P8 5

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P3 19

P2 30

P1 27

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 455

Now running: P6

------------------------------------------------------------------------

Ready Queue: Process Burst

P4 13

P5 12

P8 5

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P3 12

P2 23

P1 20

P7 44

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 473

Now running: P4

------------------------------------------------------------------------

Ready Queue: Process Burst

P3 9

P5 12

P8 5

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P2 5

P1 2

P7 26

P6 31

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 486

Now running: P5

------------------------------------------------------------------------

Ready Queue: Process Burst

P1 8

P2 19

P3 9

P8 5

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P7 13

P6 18

P4 54

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 498

Now running: P8

------------------------------------------------------------------------

Ready Queue: Process Burst

P1 8

P2 19

P3 9

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P7 1

P6 6

P4 42

P5 21

------------------------------------------------------------------------

Completed: [empty]

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 503

Now running: P3

------------------------------------------------------------------------

Ready Queue: Process Burst

P1 8

P2 19

P7 6

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P6 1

P4 37

P5 16

P8 21

------------------------------------------------------------------------

Completed: P3

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 512

Now running: P1

------------------------------------------------------------------------

Ready Queue: Process Burst

P2 19

P6 6

P7 6

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P4 28

P5 7

P8 12

------------------------------------------------------------------------

Completed: P3

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 520

Now running: P2

------------------------------------------------------------------------

Ready Queue: Process Burst

P5 10

P6 6

P7 6

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P4 20

P8 4

P1 27

------------------------------------------------------------------------

Completed: P3

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 539

Now running: P7

------------------------------------------------------------------------

Ready Queue: Process Burst

P5 10

P6 6

P8 8

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P4 1

P1 8

P2 39

------------------------------------------------------------------------

Completed: P3

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 545

Now running: P6

------------------------------------------------------------------------

Ready Queue: Process Burst

P4 11

P5 10

P8 8

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P1 2

P2 33

P7 54

------------------------------------------------------------------------

Completed: P3

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 551

Now running: P5

------------------------------------------------------------------------

Ready Queue: Process Burst

P1 3

P4 11

P8 8

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P2 27

P7 48

P6 22

------------------------------------------------------------------------

Completed: P3

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 561

Now running: P8

------------------------------------------------------------------------

Ready Queue: Process Burst

P1 3

P4 11

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P2 17

P7 38

P6 12

P5 33

------------------------------------------------------------------------

Completed: P3

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 569

Now running: P4

------------------------------------------------------------------------

Ready Queue: Process Burst

P1 3

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P2 9

P7 30

P6 4

P5 25

P8 31

------------------------------------------------------------------------

Completed: P3

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 580

Now running: P1

------------------------------------------------------------------------

Ready Queue: Process Burst

P2 10

P6 16

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P7 19

P5 14

P8 20

P4 61

------------------------------------------------------------------------

Completed: P1 P3

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 583

Now running: P6

------------------------------------------------------------------------

Ready Queue: Process Burst

P2 10

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P7 16

P5 11

P8 17

P4 58

------------------------------------------------------------------------

Completed: P1 P3 P6

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 599

Now running: P2

------------------------------------------------------------------------

Ready Queue: Process Burst

P5 11

P7 5

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P8 1

P4 42

------------------------------------------------------------------------

Completed: P1 P3 P6

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 609

Now running: P5

------------------------------------------------------------------------

Ready Queue: Process Burst

P7 5

P8 6

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P4 32

P2 31

------------------------------------------------------------------------

Completed: P1 P3 P5 P6

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 620

Now running: P7

------------------------------------------------------------------------

Ready Queue: Process Burst

P8 6

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P4 21

P2 20

------------------------------------------------------------------------

Completed: P1 P3 P5 P6

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 625

Now running: P8

------------------------------------------------------------------------

Ready Queue: Process Burst

[empty]

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P4 16

P2 15

P7 21

------------------------------------------------------------------------

Completed: P1 P3 P5 P6

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 640

Now running: P2

------------------------------------------------------------------------

Ready Queue: Process Burst

[empty]

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P4 10

P7 15

P8 44

------------------------------------------------------------------------

Completed: P1 P2 P3 P5 P6

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 647

Now running: P4

------------------------------------------------------------------------

Ready Queue: Process Burst

[empty]

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P7 8

P8 37

------------------------------------------------------------------------

Completed: P1 P2 P3 P4 P5 P6

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 657

Now running: P7

------------------------------------------------------------------------

Ready Queue: Process Burst

P4 10

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P8 27

------------------------------------------------------------------------

Completed: P1 P2 P3 P4 P5 P6

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 663

Now running: P4

------------------------------------------------------------------------

Ready Queue: Process Burst

[empty]

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P8 21

P7 43

------------------------------------------------------------------------

Completed: P1 P2 P3 P5 P6

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 675

Now running: P8

------------------------------------------------------------------------

Ready Queue: Process Burst

[empty]

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

P7 33

------------------------------------------------------------------------

Completed: P1 P2 P3 P4 P5 P6

------------------------------------------------------------------------

------------------------------------------------------------------------

Current Time: 706

Now running: P7

------------------------------------------------------------------------

Ready Queue: Process Burst

[empty]

------------------------------------------------------------------------

Now in I/O: Process Remaining I/O time

------------------------------------------------------------------------

Completed: P1 P2 P3 P4 P5 P6 P8

------------------------------------------------------------------------

------------------------------------------------------------------------

Finished

Total Time: 710

CPU Utilization: 95.3521%

Waiting Times P1 P2 P3 P4 P5 P6 P7 P8

298 233 249 231 298 243 315 341

Average Waiting: 276

Turnaround Times P1 P2 P3 P4 P5 P6 P7 P8

583 647 512 657 620 599 710 684

Average Turnaround: 626.5

Response Times P1 P2 P3 P4 P5 P6 P7 P8

0 6 25 37 48 64 84 87

Average Response: 43.875