Project Title : CPU Scheduling

– Round Robin

Submission Last Date : 15th April 2018.

Subject : Operating System

Subject Code : CSCI-509-M01

Professor : Susan Gass.

Name: Shariq Khan

Student Id: 1225726

Graduate – MS- CS
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1. Introduction

The project aims at implementing Round Robin CPU Scheduling Algorithm using Java Programming and

1.1 PROJECT AIM AND OBJECTIVE

The aim and objective of the project is to provide a simple and user-friendly experience to understand the implementation of Round Robin Scheduling.

1.2 BACKGROUND OF PROJECT – Round Robin

- Round Robin is the preemptive process scheduling algorithm.
- Each process is provided a fix time to execute, it is called a quantum.
- Once a process is executed for a given time period, it is preempted, and other process executes for a given time period.
- Context switching is used to save states of preempted processes.

According to simple RR scheduling:

Process Id	CPU Burst Time (ms)
P1	22
P2	18
P3	9
P4	10
P5	5

RR quantum=5
According to the simple RR algorithm:

Gantt chart:

P1	P2	P3	P4	P5	P1	P2	P3	P4	P1	P2

P1	P2	P1

No. of context switches =13
Average waiting time=34 ms
Average turnaround time= 46.8 ms

According to proposed algorithm:-

Gantt chart:

P1	P2	P3	P4	P5	P3	P4	P2	P1	P1	P2

No of context switches = 9
Average waiting time =29.8 ms
Average turn around time = 42.6 ms

1.2 OPERATION ENVIRONMENT

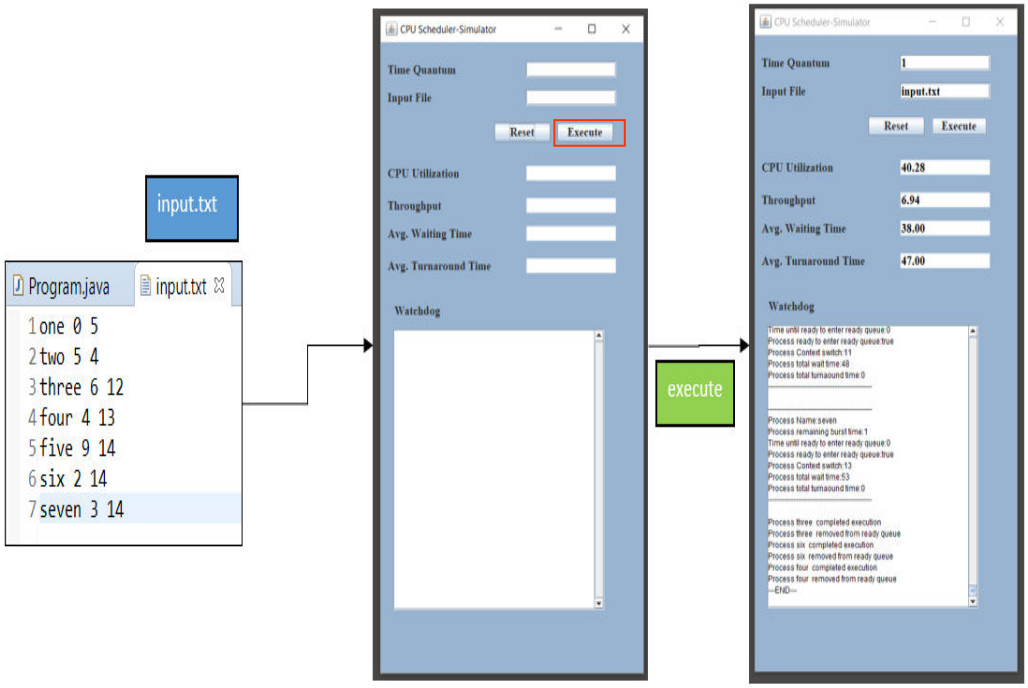
PROCESSOR	Intel Dual Core or Higher
OPERATING SYSTEM	Windows 10
MEMORY	1 GB RAM or Higher
HARD DISK	Depends on Data Storage.
JAVA RUNTIME ENVIRONMENT	1.8.0_151

1.3 SOFTWARE

Programming IDE	Eclipse Java EE IDE for Web Developers.
	Version: Oxygen.3a Release (4.73a)
JAVA	Java SDK 1.8

The program has been coded in Java and the for the User Interface Swing has been used. The below diagram is the architecture of the Project.

2. Functional Flow

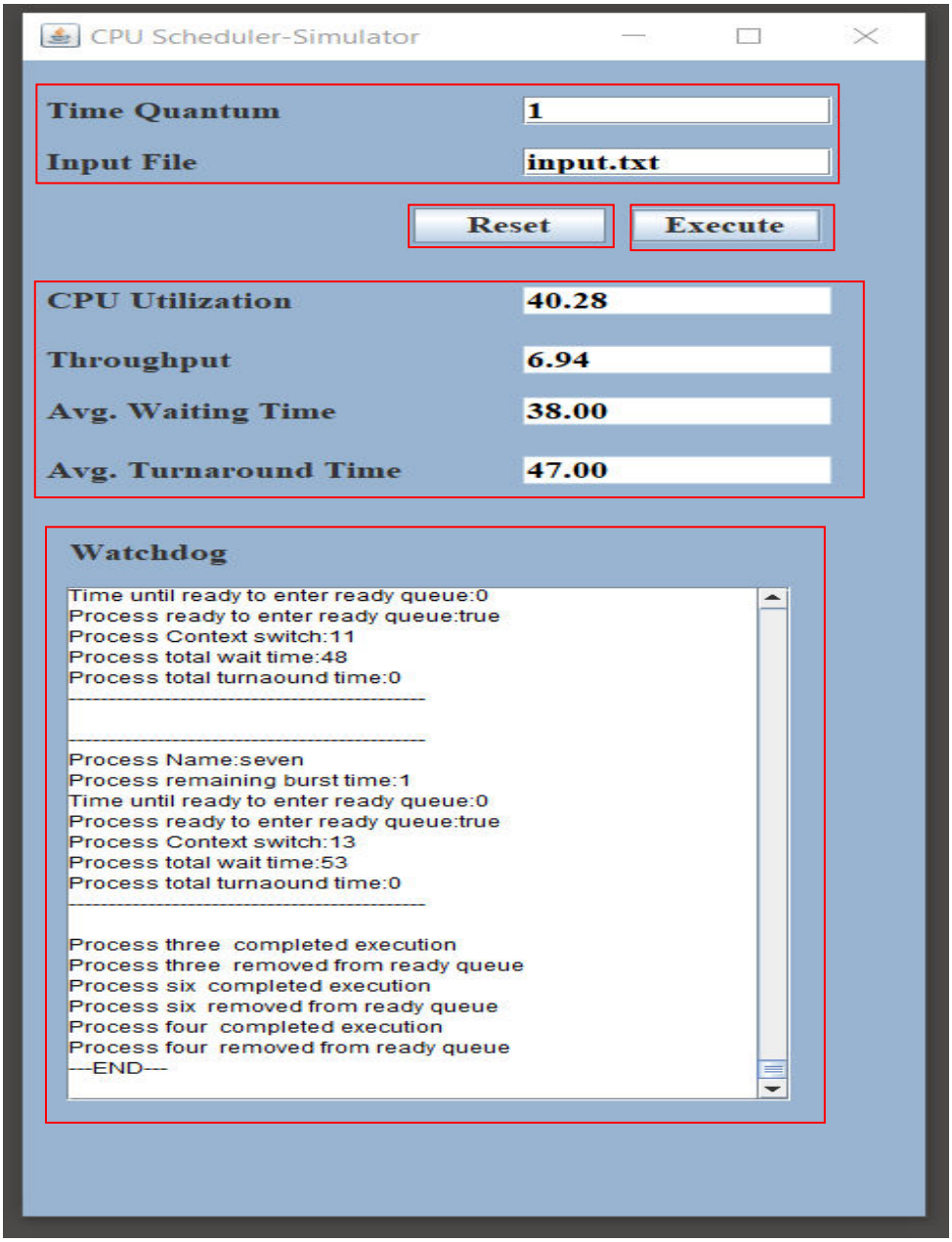


3. Functions

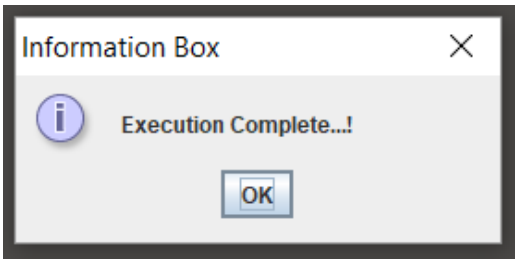
The Reset button is also added into the panel so that text entered are cleared and user can provide details again.

The execute button starts the program and displays the CPU Utilization, Throughput, average waiting time and average turnaround time.

Time Quantum and Input file is provided by the user and Watchdog displays the Context switching Process execution in queue.

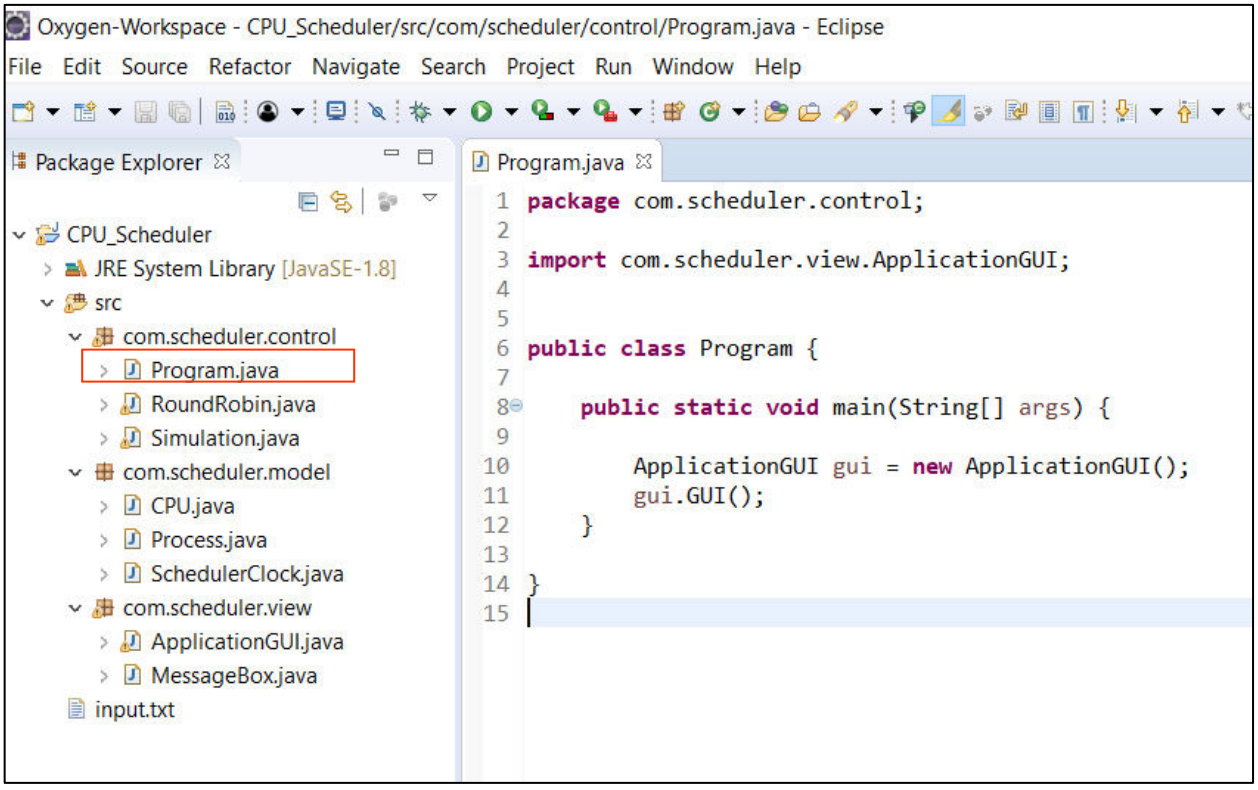


For every execution there will be a message information popup for execution completion.



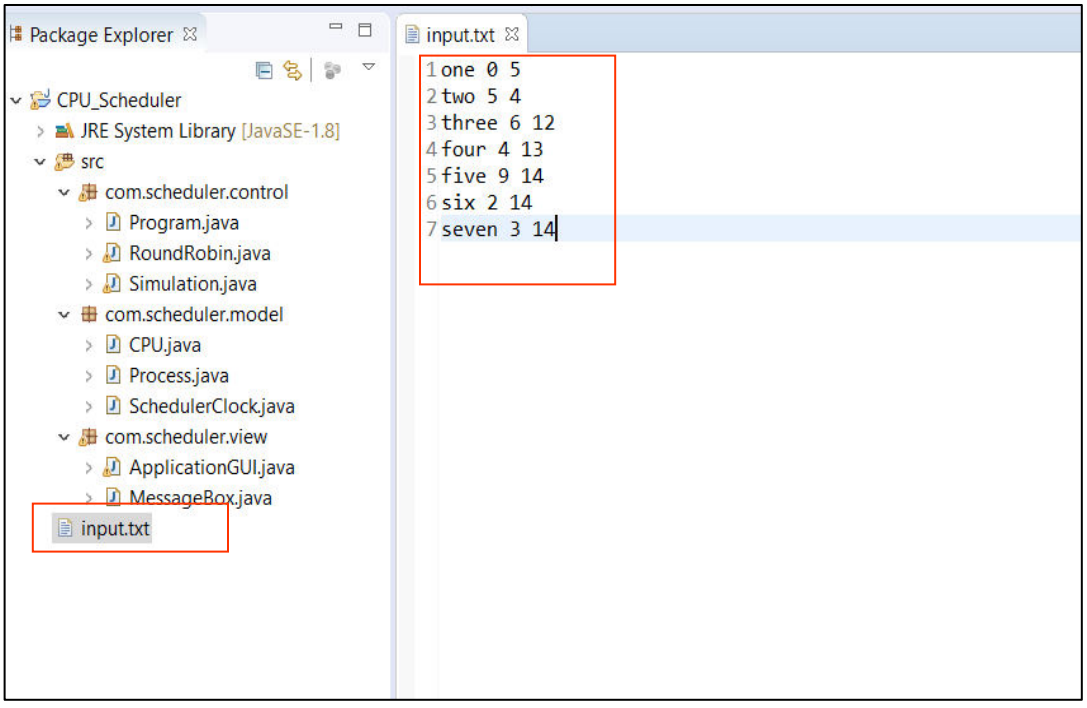
4. Program Execution

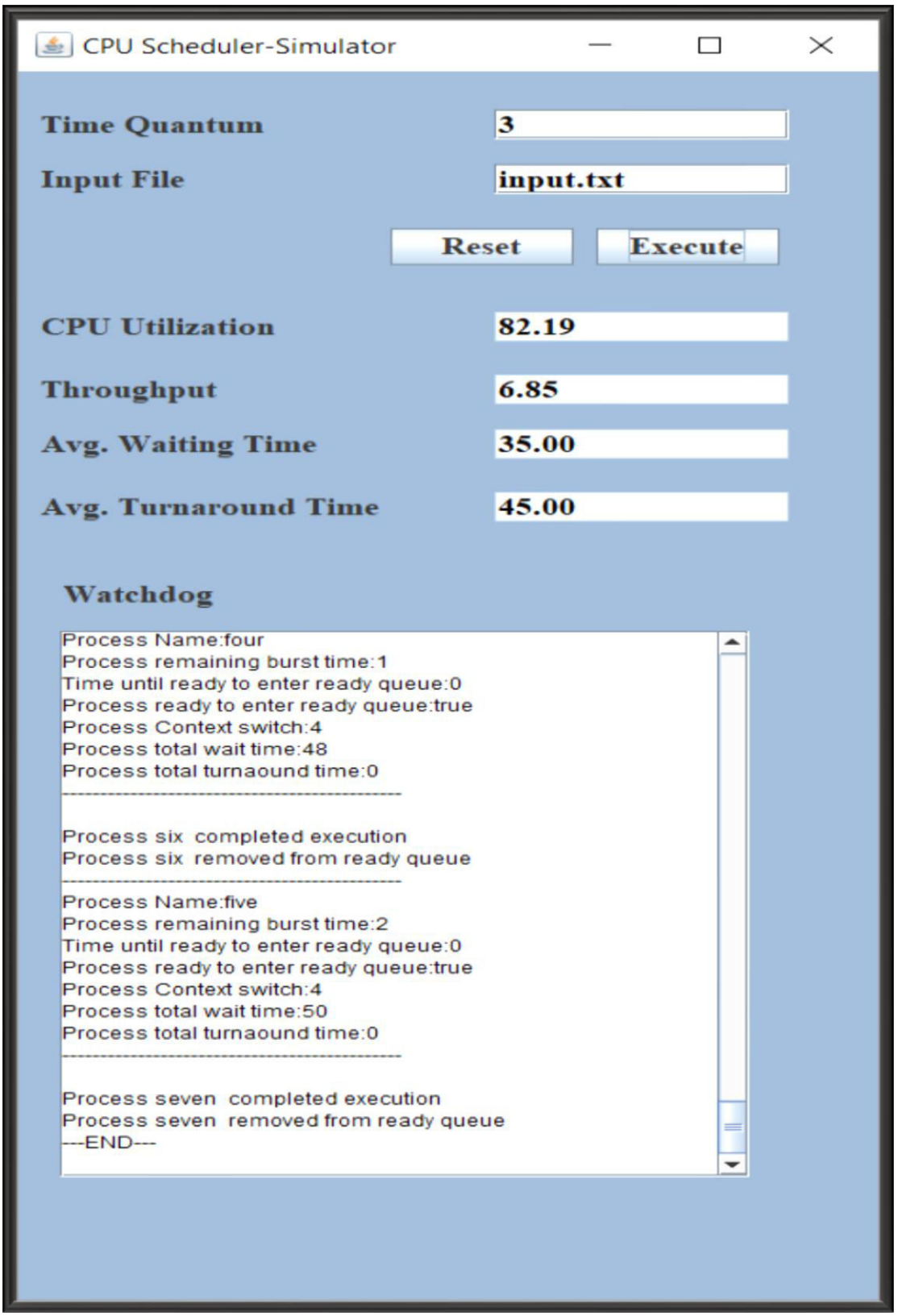
Open the Project in eclipse and run the Program.java as Java Application.



5. Analysis (Time Quantum – 3,4,5,6,7,1)

Process	Arrival Time	Burst Time
One	0	5
Two	5	4
Three	6	12
Four	4	13
Five	9	14
Six	2	14
Seven	3	14

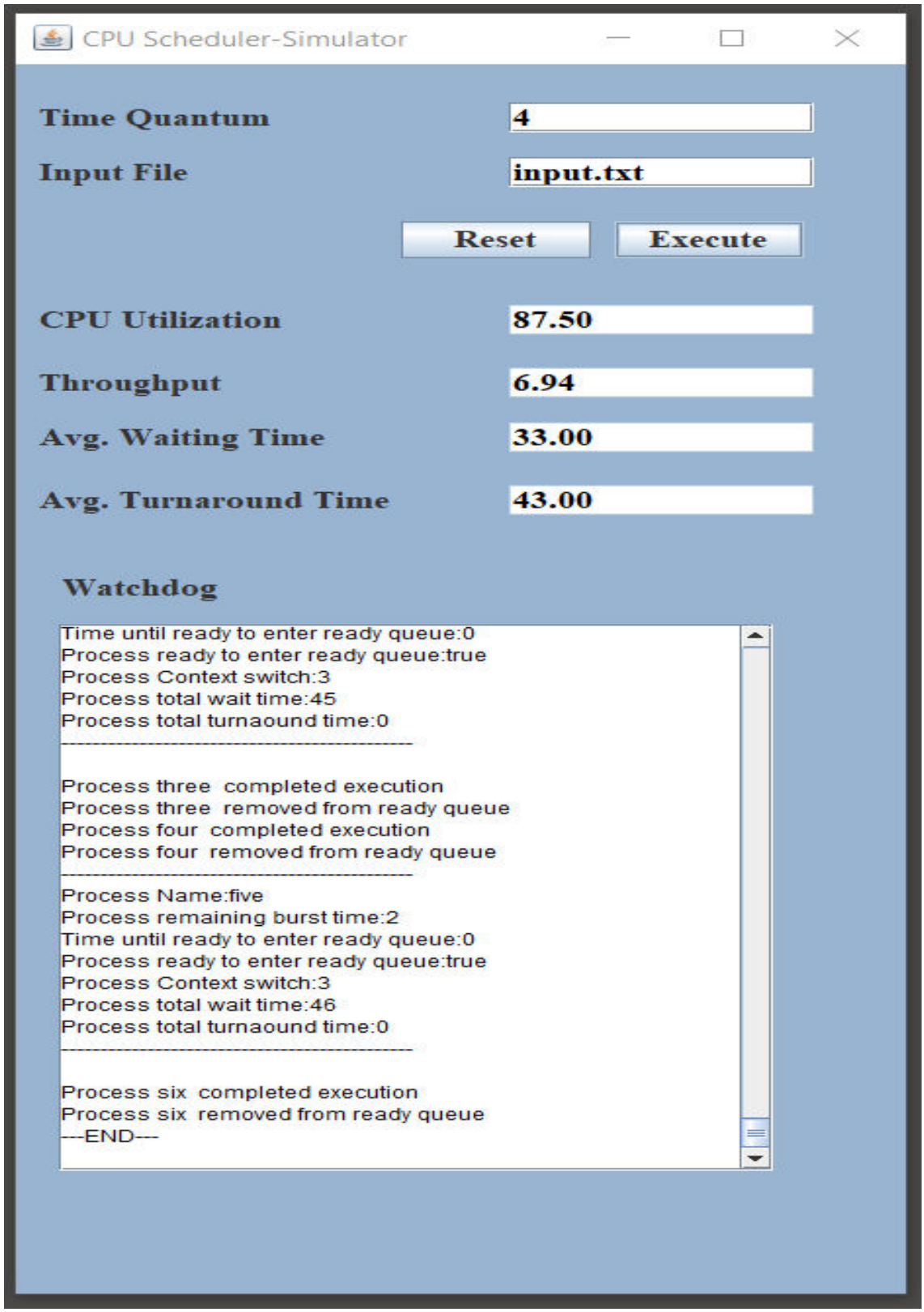



CPU Scheduler-Simulator
Time Quantum
3
Input File
input.txt
Reset
Execute
CPU Utilization
82.19
Throughput
6.85
Avg. Waiting Time
35.00
Avg. Turnaround Time
45.00
Watchdog
Process Name:four
Process remaining burst time:1
Time until ready to enter ready queue:0
Process ready to enter ready queue:true
Process Context switch:4
Process total wait time:48
Process total turnaound time:0

Process six completed execution
Process six removed from ready queue

Process Name:five
Process remaining burst time:2
Time until ready to enter ready queue:0
Process ready to enter ready queue:true
Process Context switch:4
Process total wait time:50
Process total turnaound time:0

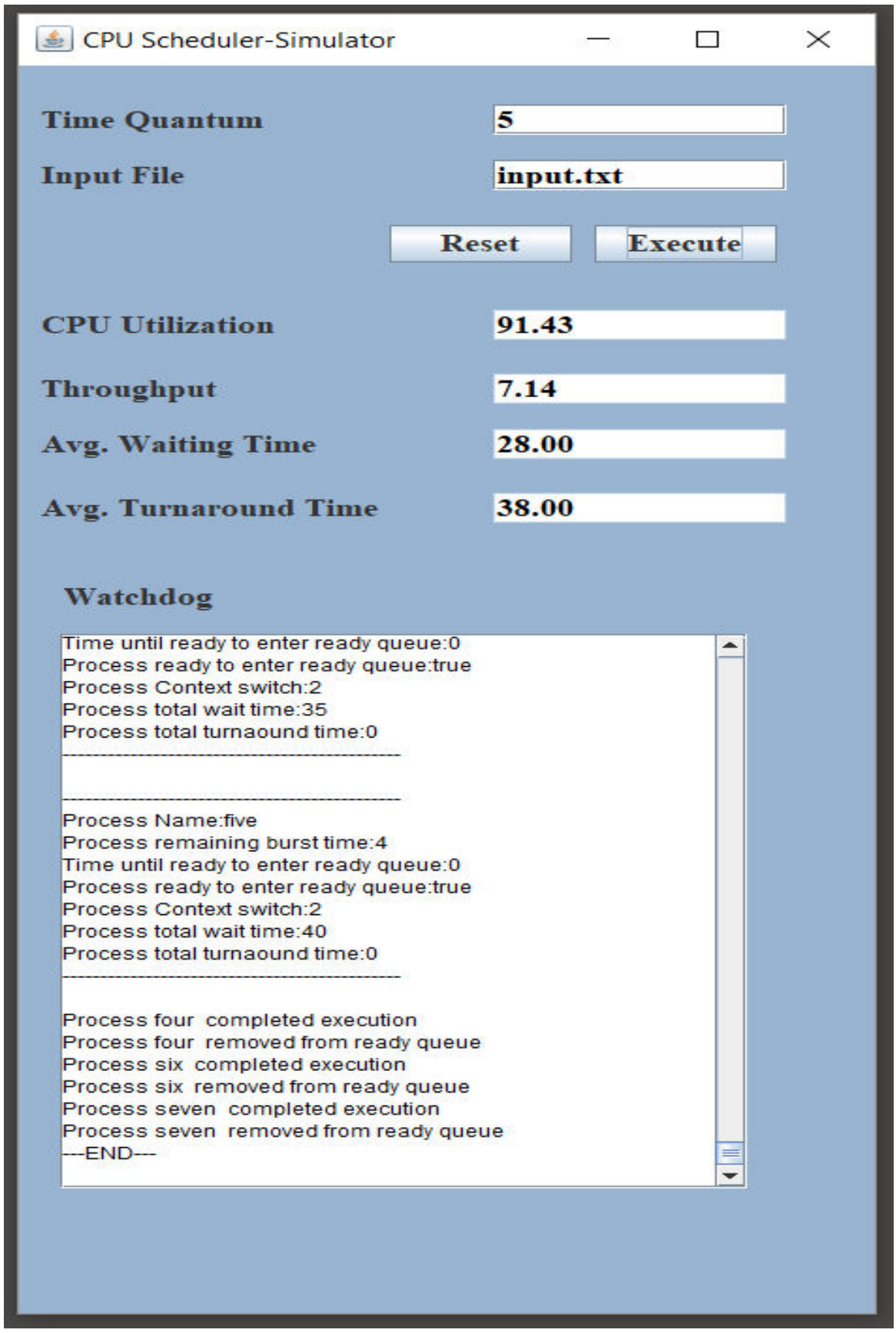
Process seven completed execution
Process seven removed from ready queue
---END---


CPU Scheduler-Simulator
Time Quantum
4
Input File
input.txt
Reset
Execute
CPU Utilization
87.50
Throughput
6.94
Avg. Waiting Time
33.00
Avg. Turnaround Time
43.00
Watchdog
Time until ready to enter ready queue:0
Process ready to enter ready queue:true
Process Context switch:3
Process total wait time:45
Process total turnaound time:0

Process three completed execution
Process three removed from ready queue
Process four completed execution
Process four removed from ready queue

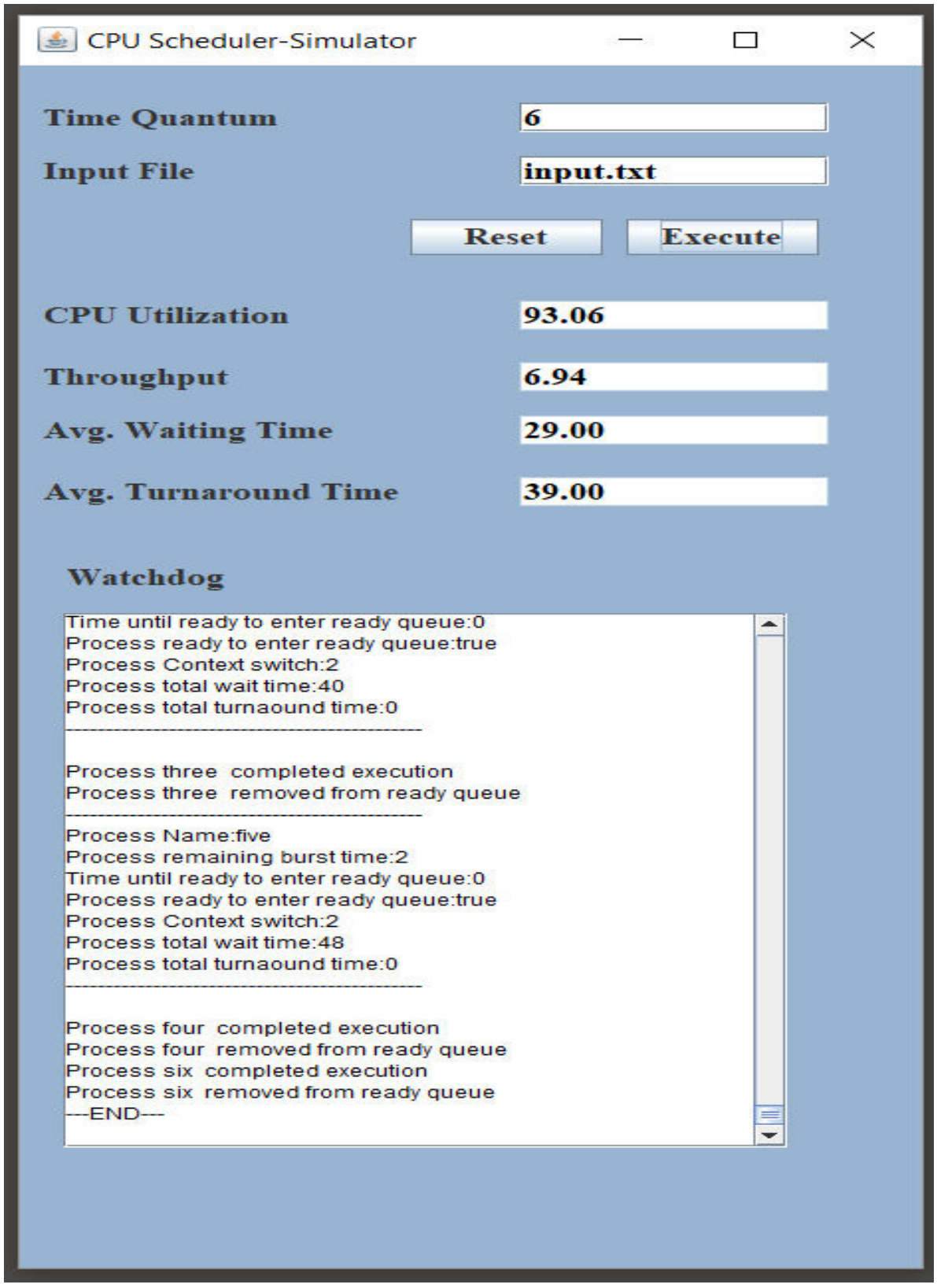
Process Name:five
Process remaining burst time:2
Time until ready to enter ready queue:0
Process ready to enter ready queue:true
Process Context switch:3
Process total wait time:46
Process total turnaound time:0

Process six completed execution
Process six removed from ready queue
---END---


CPU Scheduler-Simulator
Time Quantum
5
Input File
input.txt
Reset
Execute
CPU Utilization
91.43
Throughput
7.14
Avg. Waiting Time
28.00
Avg. Turnaround Time
38.00
Watchdog
Time until ready to enter ready queue:0
Process ready to enter ready queue:true
Process Context switch:2
Process total wait time:35
Process total turnaound time:0

Process Name:five
Process remaining burst time:4
Time until ready to enter ready queue:0
Process ready to enter ready queue:true
Process Context switch:2
Process total wait time:40
Process total turnaound time:0

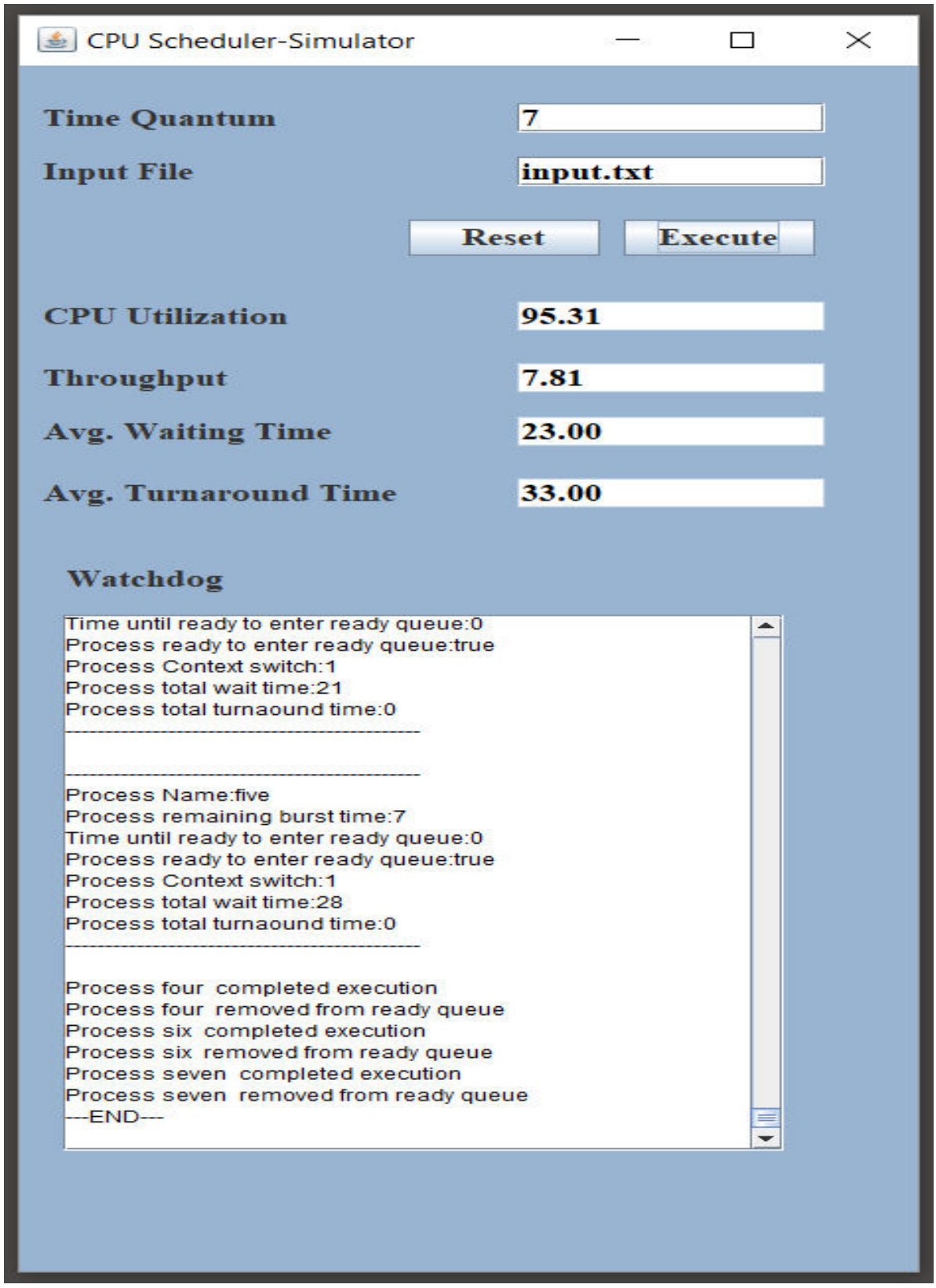
Process four completed execution
Process four removed from ready queue
Process six completed execution
Process six removed from ready queue
Process seven completed execution
Process seven removed from ready queue
---END---


CPU Scheduler-Simulator
Time Quantum
6
Input File
input.txt
Reset
Execute
CPU Utilization
93.06
Throughput
6.94
Avg. Waiting Time
29.00
Avg. Turnaround Time
39.00
Watchdog
Time until ready to enter ready queue:0
Process ready to enter ready queue:true
Process Context switch:2
Process total wait time:40
Process total turnaound time:0

Process three completed execution
Process three removed from ready queue

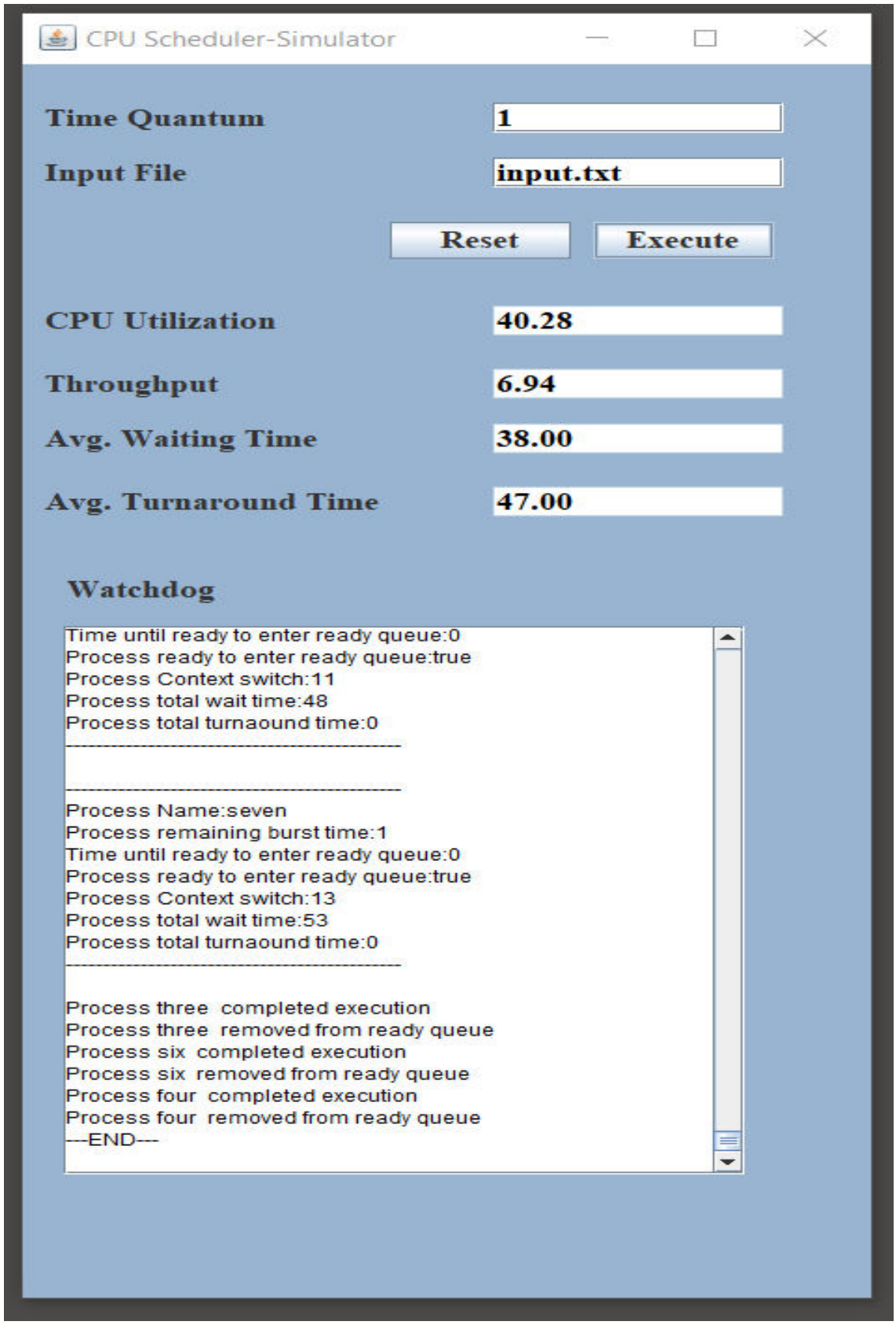
Process Name:five
Process remaining burst time:2
Time until ready to enter ready queue:0
Process ready to enter ready queue:true
Process Context switch:2
Process total wait time:48
Process total turnaound time:0

Process four completed execution
Process four removed from ready queue
Process six completed execution
Process six removed from ready queue
---END---


CPU Scheduler-Simulator
Time Quantum
7
Input File
input.txt
Reset
Execute
CPU Utilization
95.31
Throughput
7.81
Avg. Waiting Time
23.00
Avg. Turnaround Time
33.00
Watchdog
Time until ready to enter ready queue:0
Process ready to enter ready queue:true
Process Context switch:1
Process total wait time:21
Process total turnaound time:0

Process Name:five
Process remaining burst time:7
Time until ready to enter ready queue:0
Process ready to enter ready queue:true
Process Context switch:1
Process total wait time:28
Process total turnaound time:0

Process four completed execution
Process four removed from ready queue
Process six completed execution
Process six removed from ready queue
Process seven completed execution
Process seven removed from ready queue
---END---


CPU Scheduler-Simulator
Time Quantum
1
Input File
input.txt
Reset
Execute
CPU Utilization
40.28
Throughput
6.94
Avg. Waiting Time
38.00
Avg. Turnaround Time
47.00
Watchdog
Time until ready to enter ready queue:0
Process ready to enter ready queue:true
Process Context switch:11
Process total wait time:48
Process total turnaound time:0

Process Name:seven
Process remaining burst time:1
Time until ready to enter ready queue:0
Process ready to enter ready queue:true
Process Context switch:13
Process total wait time:53
Process total turnaound time:0

Process three completed execution
Process three removed from ready queue
Process six completed execution
Process six removed from ready queue
Process four completed execution
Process four removed from ready queue
---END---

Conclusion

In Round Robin Scheduling the time quantum is fixed and then processes are scheduled such that no process get CPU time more than one time quantum in one go. If time quantum is too large, the response time of the processes is too much which may not be tolerated in interactive environment. If time quantum is too small, it causes unnecessarily frequent context switch leading to more overheads resulting in less throughput.

6. References

1. http://en.wikipedia.org./wiki/scheduling [2]
2. Operating Systems Sibsankar Haldar 2009,Pearson Education, India
3. D.M. Dhamdhere operating Systems A Concept Based Approach, Second edition, Tata McGraw-Hill, 2006.
4. Sabrina, F.C.D, Nguyen, S.jha, D. Platt and F. Safaei, 2005.Processing scheduling in programmable networks. Computer commun, 28:676-687.
5. Silberchatz, Galvin and Gagne, 2003. Operating systems concepts.