MANIPAL UNIVERSITY JAIPUR

Faculty of Engineering | School of Computing and Intelligent Systems

Department of IoT & IS

Session: Jan 2024 – May 2024 | **Program:** B. Tech. IoT & IS | **Semester:** IV

IS2201 Operating System

Group Assignment 2

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Process Scheduling

Consider the following source codes:

program looptest

read(i) for n = 1 to 15 x = i + n next

end

Compile the above source code using **CPU-OS Simulator** and load it in the main memory and run this code. To enter the OS simulator:

1. Click on the OS O… button in the current window. The OS window opens.
2. You should see an entry titled as the program name given above, in the PROGRAM LIST view.
3. Now that this program is available to the OS simulator, we can create as many instances, i.e. processes, of it as we like. You do this by clicking on the CREATE NEW PROCESS button.

PART-A

- Select the **First-Come-First-Served (FCFS)** option in the SCHEDULER/Policies view
- Time slice should be considered as **seconds.**
- Create four processes P1, P2, P3 and P4 from source code respectively (Use the

Priority drop-down list in the PROGRAM LIST / Process View): **3, 2, 4,1** ➢ Slide the Speed selector half-way down and then hit the START button.

- **Arrival delay** should be considered in **seconds** in the OS simulator **Now, give answer for the following:**

1. What is the order in which processes are executed?

P1-P2-P3-P4

1. What is the ***Elapsed time , Average Process Waiting Time*** and ***Average Burst Period*** and of each process? (To see this, Click on VIEWS button available on the left of your OS control, the click VIEW LOG)

Process	*Arrival Time/Delay (sec)*	*Elapsed Time (sec)*	*Average Process Waiting Time (sec)*	*Average Burst Period*
P1	0	40.138	0.32	125
P2	0	38.130	160.71	125
P3	0	38.381	319.09	125
P4	0	38.381	477.72	125
	Avg. Process Waiting Time			239.46

PART-B

- Select the **Shortest Job First (SJF)** option in the SCHEDULER/Policies view
- Select the Priority (static) as **Pre-emptive** option in the SCHEDULER/Policies view ➢ Time slice should be considered as **seconds.**
- Create four processes P1, P2, P3 and P4 from source codes respectively (Use the

Priority drop-down list in the PROGRAM LIST / Process View): **3, 2, 4,1** ➢ Slide the Speed selector half-way down and then hit the START button.

- **Arrival delay** should be considered in **seconds** in the OS simulator **Now, give answer for the following:**

1. What is the order in which processes are executed?

P1-P2-P3-p4

1. What is the ***Elapsed time , Average Process Waiting Time*** and ***Average Burst Period*** and of each process? (To see this, Click on VIEWS button available on the left of your

OS control, the click VIEW LOG)

Process	***Arrival Time/Delay (sec)***	***Elapsed Time (sec)***	***Average Process Waiting Time (sec)***	***Average Burst Period***
P1	0	31.917	0.31	125
P2	0	29.310	152.46	125
P3	0	29.310	302.01	125
P4	0	29.310	451.55	125
		Avg. Process Waiting Time =		226.58

PART-C

- Select the **Round Robin (RR) with 5 seconds as time slice** option in the SCHEDULER/Policies view.
- Select the Priority (static) as **Pre-emptive** option in the SCHEDULER/Policies view
- Time slice should be taken in terms of **seconds** instead of **ticks**
- Create four processes P1, P2, P3 and P4 from source codes respectively (Use the

Priority drop-down list in the PROGRAM LIST / Process View): **3, 2, 4,1** ➢ Slide the Speed selector half-way down and then hit the START button.

- **Arrival delay** should be considered in **seconds** in the OS simulator **Now, give answer for the following:**

1. What is the order in which processes are executed?

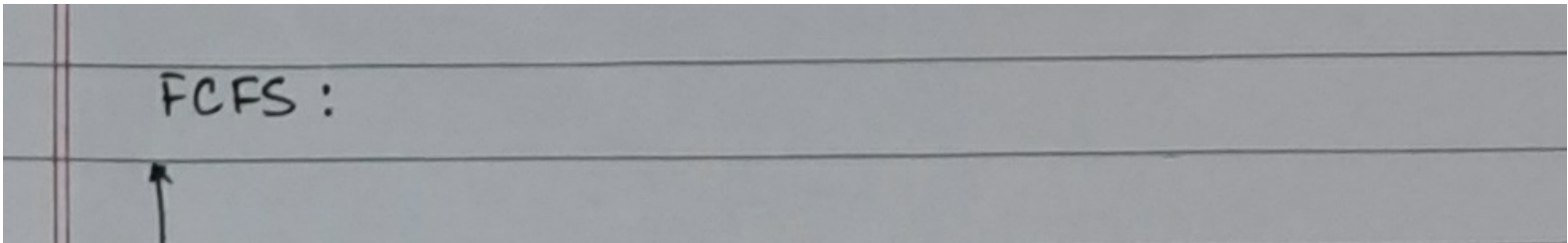
P4-P2-P1-P3

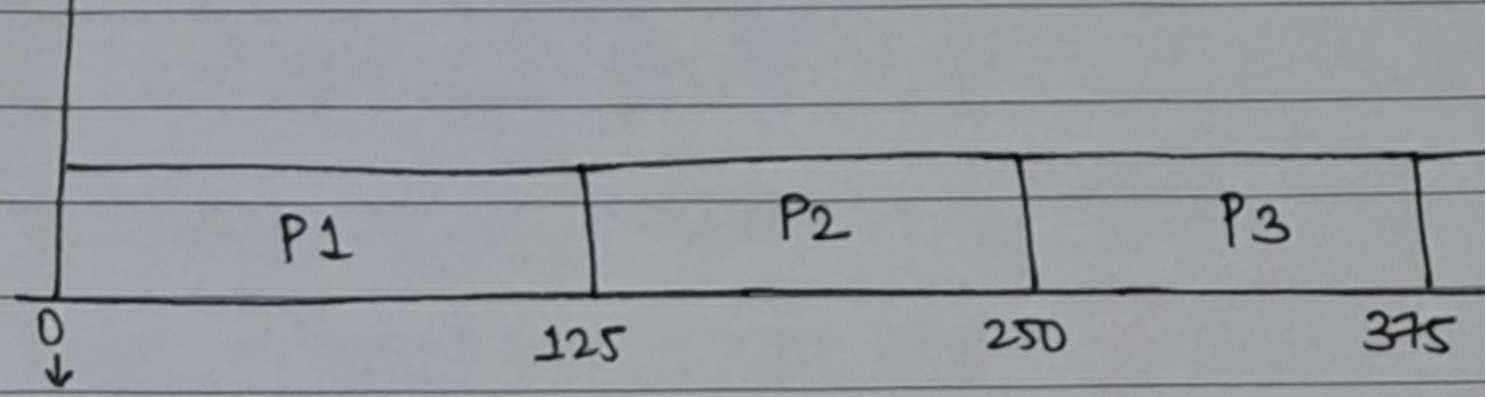
1. What is the ***Elapsed time , Average Process Waiting Time*** and ***Average Burst Period*** and of each process? (To see this, Click on VIEWS button available on the left of your OS control, the click VIEW LOG)

Process	***Arrival Time/Delay (sec)***	***Elapsed Time (sec)***	***Average Process Waiting Time (sec)***	***Average Burst Period***
P1	0	36.657	10.15	3
P2	0	36.894	5.09	3
P3	0	29.311	474.31	125
P4	0	39.739	0.24	3
	Avg. Process Waiting Time =			166.23

PART-D

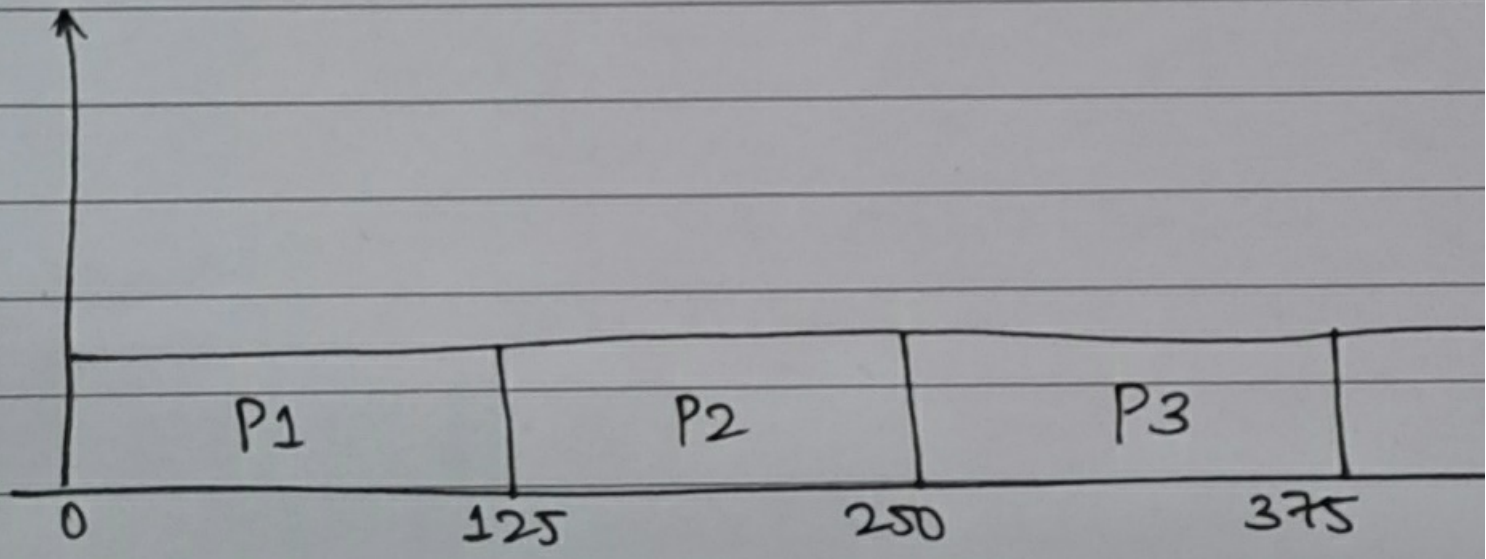
1. Plot a graph from the results obtained by FCFS, SJF and Round Robin scheduling and explain which algorithm is better among these with proper justification.



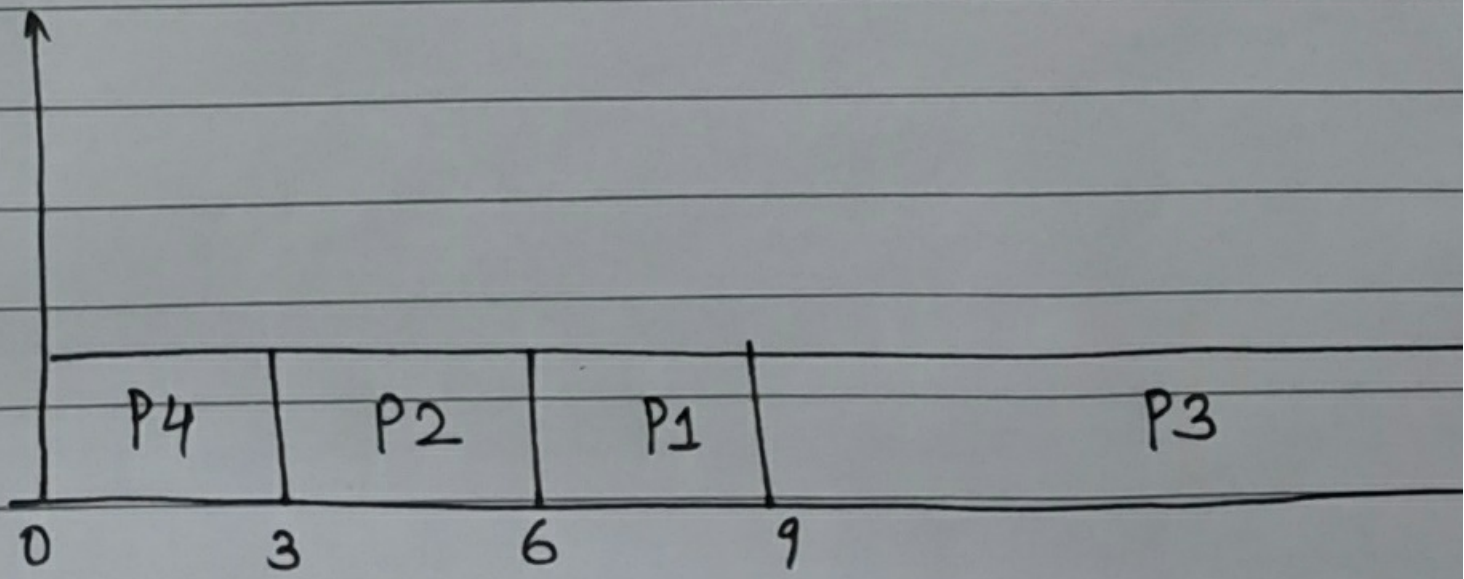


P1, P2, P3, P4

SJF :

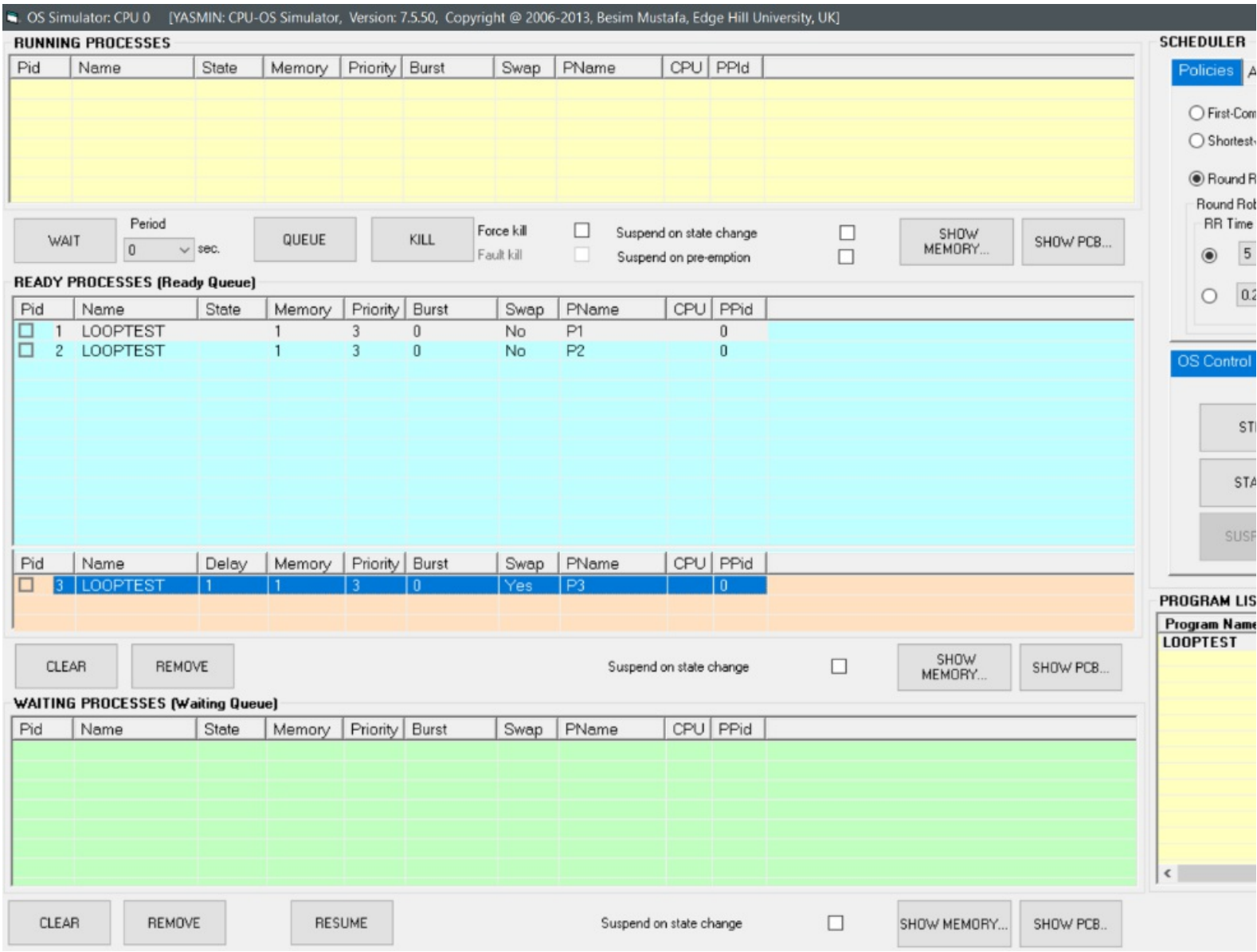


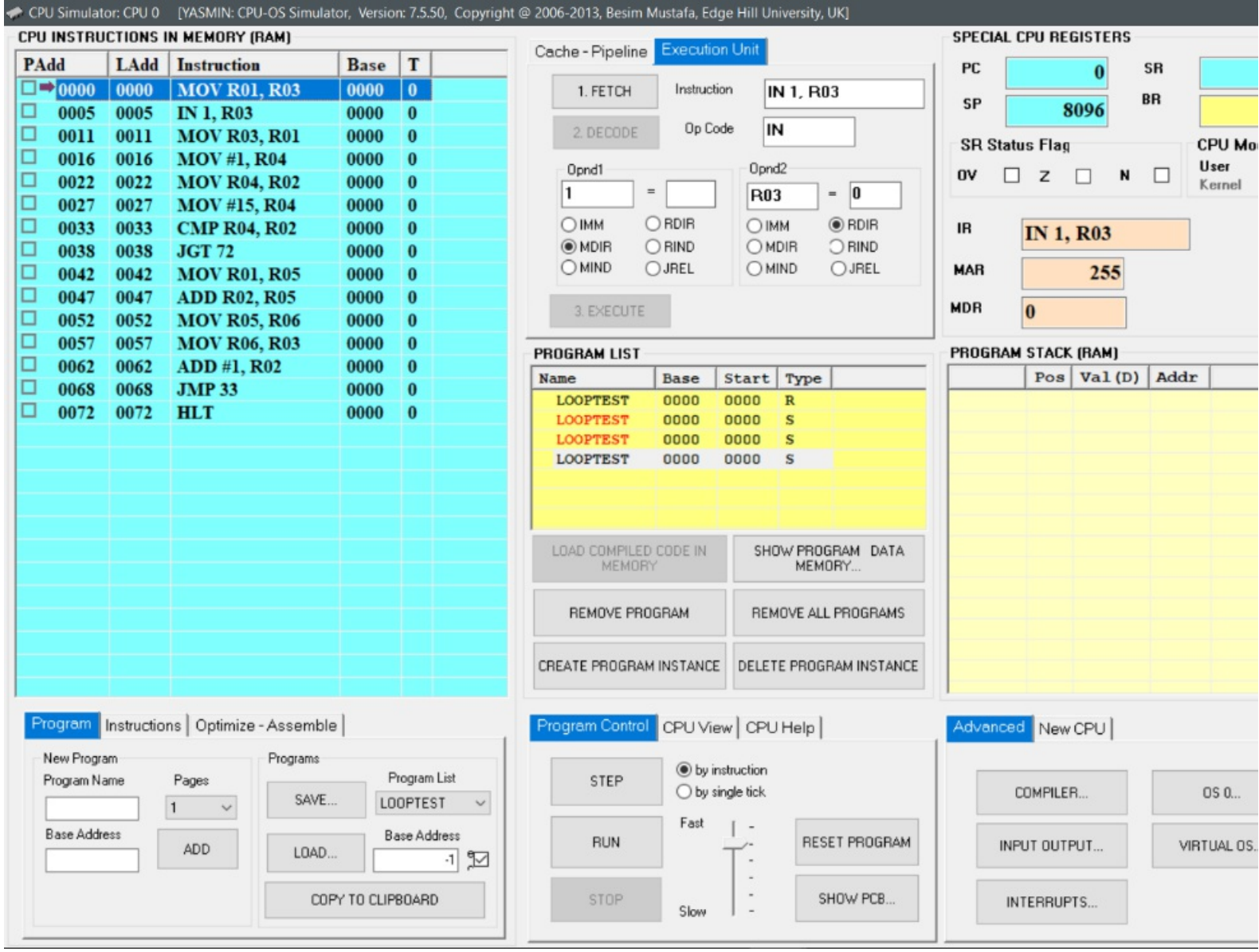
RR :

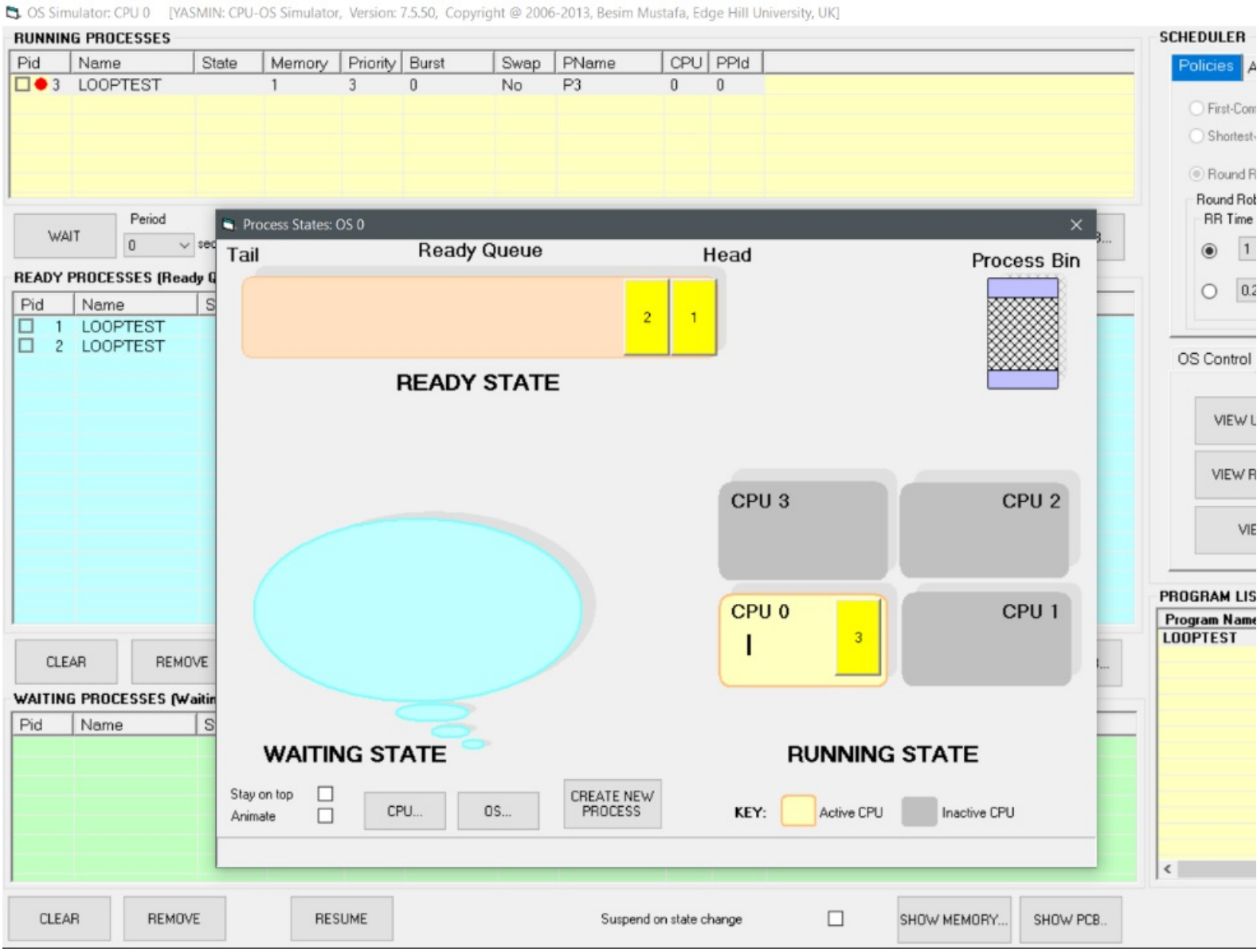


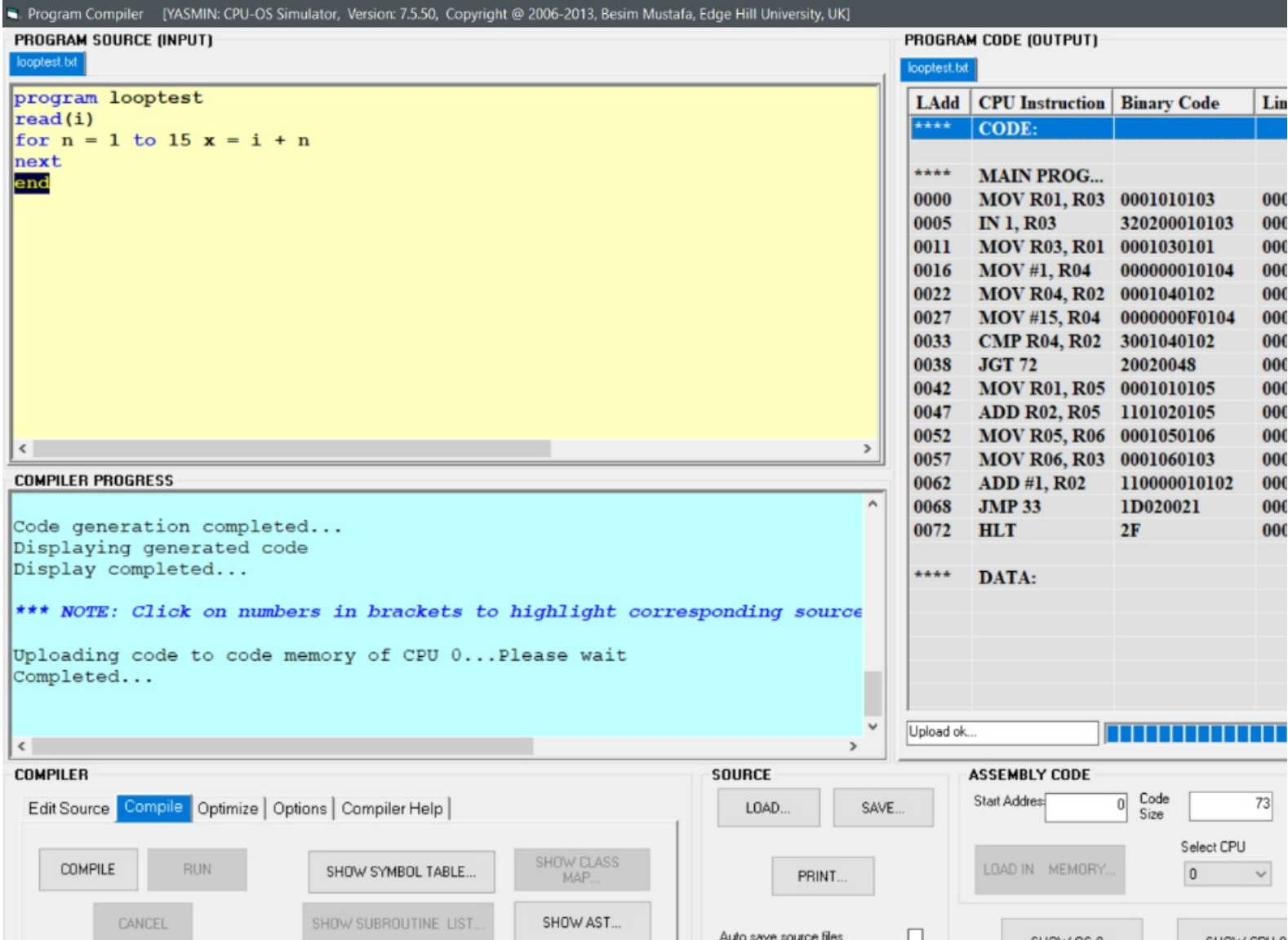
The best method to slove the problem is **Round Robin method** as it is having the least avg. waiting time.

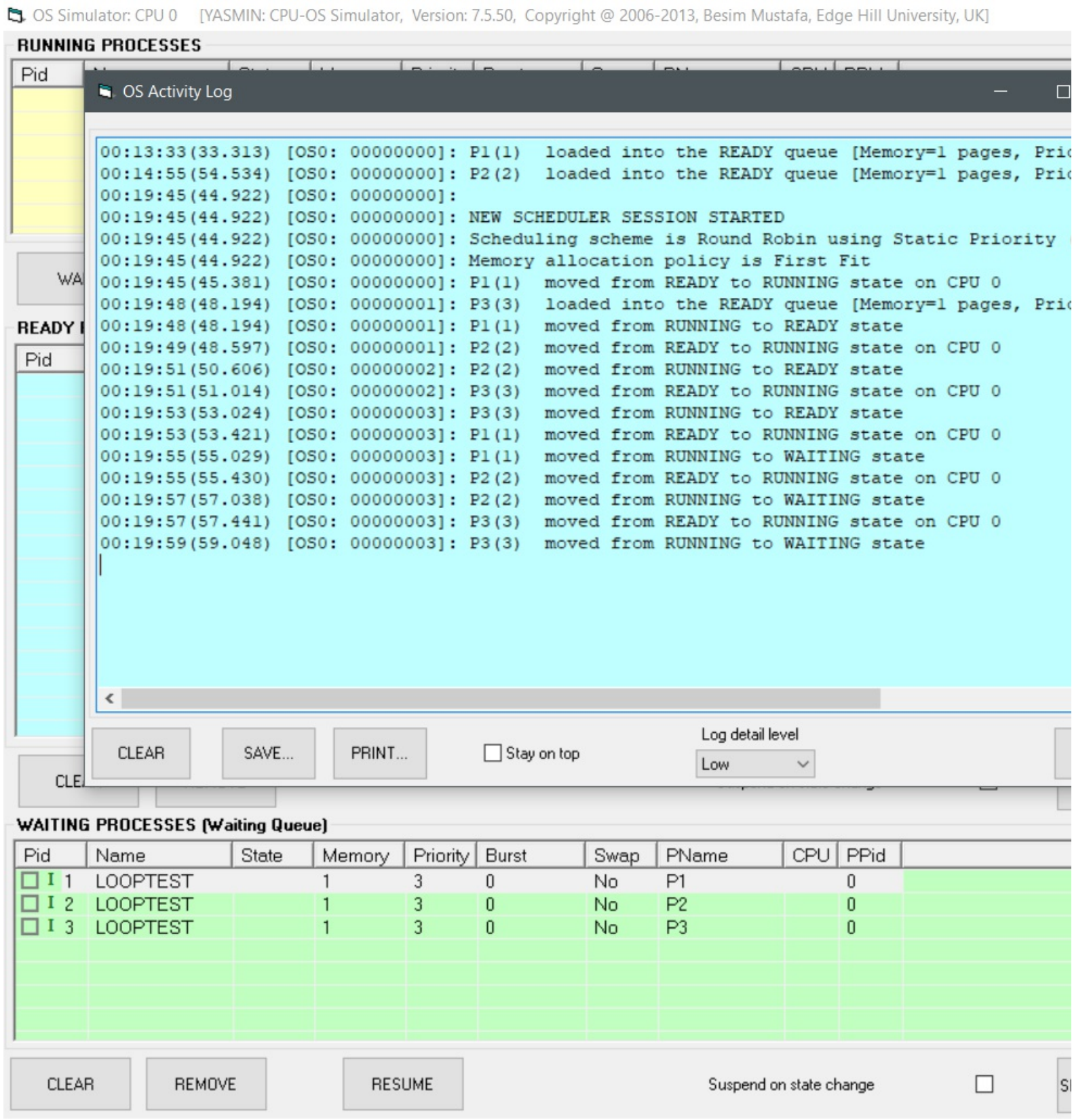
ScreenShots




CPU Simulator: CPU 0 [YASMIN: CPU-OS Simulator, Version: 7.5.50, Copyright @ 2006-2013, Besim Mustafa, Edge Hill University, UK]
CPU INSTRUCTIONS IN MEMORY (RAM)
PAdd LAdd Instruction Base T
0000 0000 MOV R01, R03 0000 0
0005 0005 IN 1, R03 0000 0
0011 0011 MOV R03, R01 0000 0
0016 0016 MOV #1, R04 0000 0
0022 0022 MOV R04, R02 0000 0
0027 0027 MOV #15, R04 0000 0
0033 0033 CMP R04, R02 0000 0
0038 0038 JGT 72 0000 0
0042 0042 MOV R01, R05 0000 0
0047 0047 ADD R02, R05 0000 0
0052 0052 MOV R05, R06 0000 0
0057 0057 MOV R06, R03 0000 0
0062 0062 ADD #1, R02 0000 0
0068 0068 JMP 33 0000 0
0072 0072 HLT 0000 0
Cache - Pipeline
Execution Unit
1. FETCH
Instruction
IN 1, R03
2. DECODE
Op Code
IN
Opnd1
1
=
IMM
RDIR
MDIR
RIND
MIND
JREL
Opnd2
R03
=
0
IMM
RDIR
MDIR
RIND
MIND
JREL
3. EXECUTE
SPECIAL CPU REGISTERS
PC
0
SR
SP
8096
BR
SR Status Flag
OV
Z
N
CPU Mo
User
Kernel
IR
IN 1, R03
MAR
255
MDR
0
PROGRAM LIST
Name Base Start Type
LOOPTEST 0000 0000 R
LOOPTEST 0000 0000 S
LOOPTEST 0000 0000 S
LOOPTEST 0000 0000 S
LOAD COMPILED CODE IN MEMORY
SHOW PROGRAM DATA MEMORY...
REMOVE PROGRAM
REMOVE ALL PROGRAMS
CREATE PROGRAM INSTANCE
DELETE PROGRAM INSTANCE
PROGRAM STACK (RAM)
Pos Val (D) Addr
Program
Instructions
Optimize - Assemble
New Program
Program Name
Pages
1
Base Address
ADD
Programs
SAVE...
Program List
LOOPTEST
LOAD...
Base Address
-1
COPY TO CLIPBOARD
Program Control
CPU View
CPU Help
STEP
by instruction
by single tick
RUN
Fast
Slow
RESET PROGRAM
STOP
SHOW PCB...
Advanced
New CPU
COMPILER...
OS 0...
INPUT OUTPUT...
VIRTUAL OS...
INTERRUPTS...

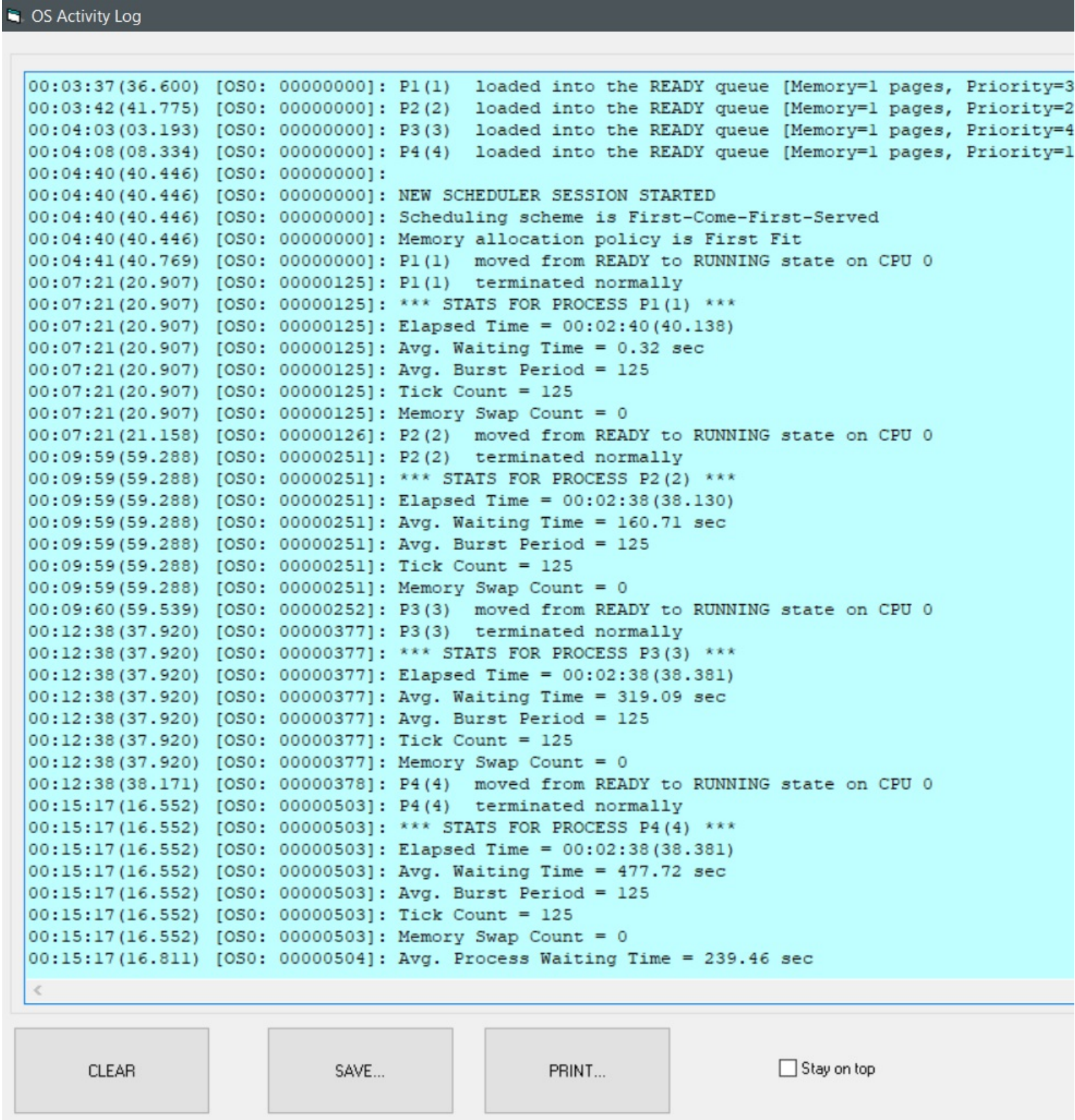

OS Simulator: CPU 0 [YASMIN: CPU-OS Simulator, Version: 7.5.50, Copyright @ 2006-2013, Besim Mustafa, Edge Hill University, UK]
RUNNING PROCESSES
Pid Name State Memory Priority Burst Swap PName CPU PPId
3 LOOPTEST 1 3 0 No P3 0 0
WAIT
Period
READY PROCESSES (Ready Q
Pid Name
1 LOOPTEST
2 LOOPTEST
CLEAR
REMOVE
WAITING PROCESSES (Waitin
Pid Name
SCHEDULER
Policies
OS Control
PROGRAM LIS
Program Name
LOOPTEST
Process States: OS 0
Tail
Ready Queue
Head
Process Bin
2
1
READY STATE
CPU 3
CPU 2
CPU 0
3
CPU 1
WAITING STATE
RUNNING STATE
Stay on top
Animate
CPU...
OS...
CREATE NEW PROCESS
KEY:
Active CPU
Inactive CPU
CLEAR
REMOVE
RESUME
Suspend on state change
SHOW MEMORY...
SHOW PCB..


Program Compiler [YASMIN: CPU-OS Simulator, Version: 7.5.50, Copyright @ 2006-2013, Besim Mustafa, Edge Hill University, UK]
PROGRAM SOURCE (INPUT)
looptest.txt
program looptest
read(i)
for n = 1 to 15 x = i + n
next
end
PROGRAM CODE (OUTPUT)
looptest.txt
LAdd
CPU Instruction
Binary Code
Lin
**** CODE:
**** MAIN PROG...
0000 MOV R01, R03 0001010103 000
0005 IN 1, R03 320200010103 000
0011 MOV R03, R01 0001030101 000
0016 MOV #1, R04 000000010104 000
0022 MOV R04, R02 0001040102 000
0027 MOV #15, R04 0000000F0104 000
0033 CMP R04, R02 3001040102 000
0038 JGT 72 20020048 000
0042 MOV R01, R05 0001010105 000
0047 ADD R02, R05 1101020105 000
0052 MOV R05, R06 0001050106 000
0057 MOV R06, R03 0001060103 000
0062 ADD #1, R02 110000010102 000
0068 JMP 33 1D020021 000
0072 HLT 2F 000
**** DATA:
Upload ok...
COMPILER PROGRESS
Code generation completed...
Displaying generated code
Display completed...
*** NOTE: Click on numbers in brackets to highlight corresponding source
Uploading code to code memory of CPU 0...Please wait
Completed...
COMPILER
Edit Source
Compile
Optimize
Options
Compiler Help
COMPILE
RUN
SHOW SYMBOL TABLE...
SHOW CLASS MAP...
CANCEL
SHOW SUBROUTINE LIST...
SHOW AST...
SOURCE
LOAD...
SAVE...
PRINT...
Auto save source files
ASSEMBLY CODE
Start Address
0
Code Size
73
Select CPU
0
LOAD IN MEMORY...
SHOW OS 0...
SHOW CPU 0

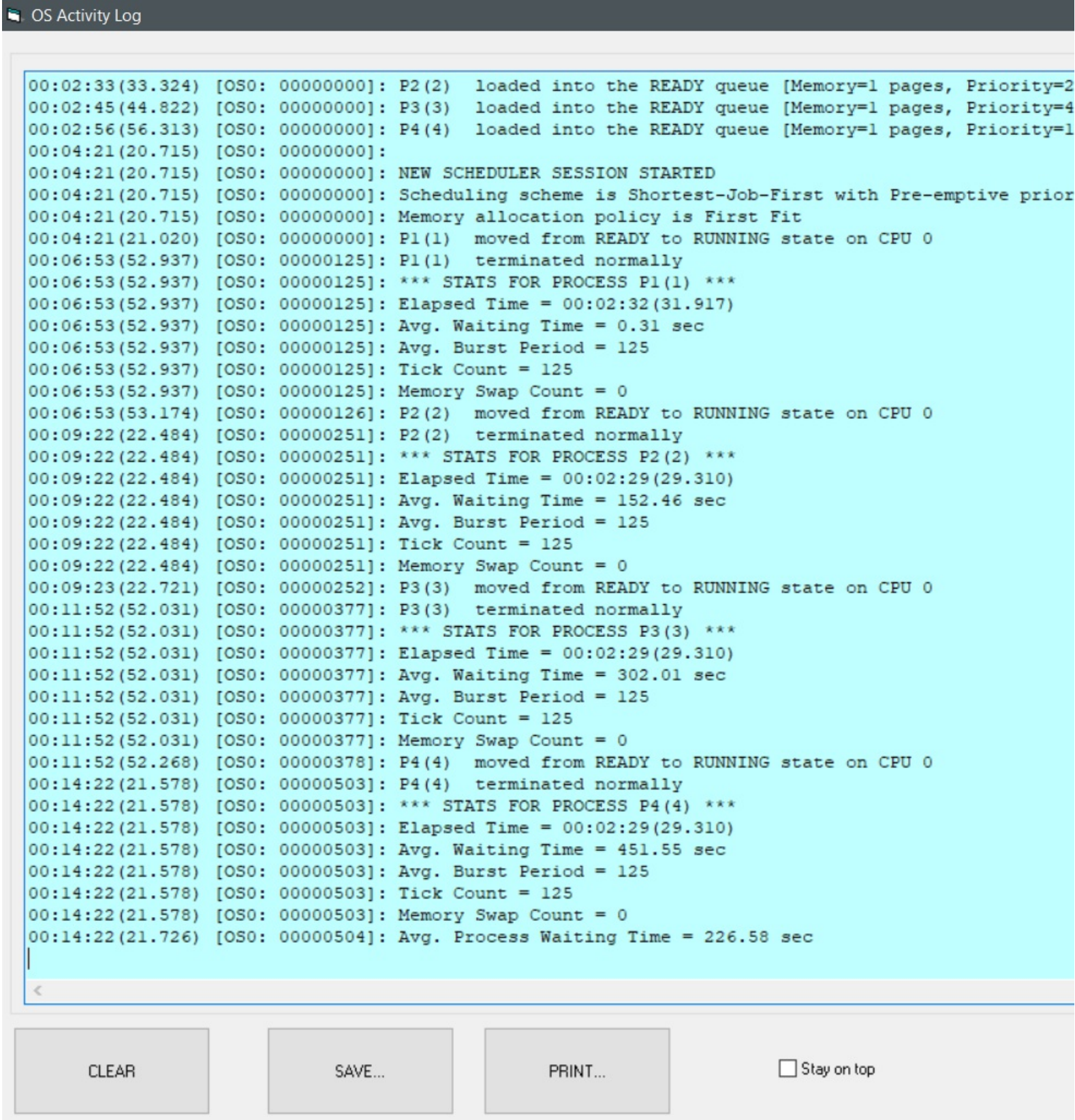


OUTPUTS

1] First Come First Serve



2]Shortest Job First



3]Round Robin

OS Activity Log

```
00:09:01(00.971) [OS0: 00000332]: P1(1)  moved from RUNNING to READY state
00:09:01(01.208) [OS0: 00000332]: P1(1)  moved from READY to RUNNING state on CPU 0
00:09:06(05.948) [OS0: 00000336]: P1(1)  moved from RUNNING to READY state
00:09:06(06.185) [OS0: 00000336]: P1(1)  moved from READY to RUNNING state on CPU 0
00:09:11(10.925) [OS0: 00000340]: P1(1)  moved from RUNNING to READY state
00:09:11(11.162) [OS0: 00000340]: P1(1)  moved from READY to RUNNING state on CPU 0
00:09:16(15.902) [OS0: 00000344]: P1(1)  moved from RUNNING to READY state
00:09:16(16.139) [OS0: 00000344]: P1(1)  moved from READY to RUNNING state on CPU 0
00:09:21(20.880) [OS0: 00000348]: P1(1)  moved from RUNNING to READY state
00:09:21(21.116) [OS0: 00000348]: P1(1)  moved from READY to RUNNING state on CPU 0
00:09:26(25.856) [OS0: 00000352]: P1(1)  moved from RUNNING to READY state
00:09:26(26.093) [OS0: 00000352]: P1(1)  moved from READY to RUNNING state on CPU 0
00:09:31(30.833) [OS0: 00000356]: P1(1)  moved from RUNNING to READY state
00:09:31(31.070) [OS0: 00000356]: P1(1)  moved from READY to RUNNING state on CPU 0
00:09:36(35.810) [OS0: 00000360]: P1(1)  moved from RUNNING to READY state
00:09:36(36.047) [OS0: 00000360]: P1(1)  moved from READY to RUNNING state on CPU 0
00:09:41(40.787) [OS0: 00000364]: P1(1)  moved from RUNNING to READY state
00:09:41(41.024) [OS0: 00000364]: P1(1)  moved from READY to RUNNING state on CPU 0
00:09:46(45.764) [OS0: 00000368]: P1(1)  moved from RUNNING to READY state
00:09:46(46.001) [OS0: 00000368]: P1(1)  moved from READY to RUNNING state on CPU 0
00:09:51(50.741) [OS0: 00000372]: P1(1)  moved from RUNNING to READY state
00:09:51(50.978) [OS0: 00000372]: P1(1)  moved from READY to RUNNING state on CPU 0
00:09:56(55.718) [OS0: 00000376]: P1(1)  moved from RUNNING to READY state
00:09:56(55.955) [OS0: 00000376]: P1(1)  moved from READY to RUNNING state on CPU 0
00:09:58(58.325) [OS0: 00000377]: P1(1)  terminated normally
00:09:58(58.325) [OS0: 00000377]: *** STATS FOR PROCESS P1(1) ***
00:09:58(58.325) [OS0: 00000377]: Elapsed Time = 00:02:37(36.657)
00:09:58(58.325) [OS0: 00000377]: Avg. Waiting Time = 10.15 sec
00:09:58(58.325) [OS0: 00000377]: Avg. Burst Period = 3
00:09:58(58.325) [OS0: 00000377]: Tick Count = 125
00:09:58(58.325) [OS0: 00000377]: Memory Swap Count = 0
00:09:59(58.562) [OS0: 00000378]: P3(3)  moved from READY to RUNNING state on CPU 0
00:12:28(27.872) [OS0: 00000503]: P3(3)  terminated normally
00:12:28(27.872) [OS0: 00000503]: *** STATS FOR PROCESS P3(3) ***
00:12:28(27.872) [OS0: 00000503]: Elapsed Time = 00:02:29(29.311)
00:12:28(27.872) [OS0: 00000503]: Avg. Waiting Time = 474.31 sec
00:12:28(27.872) [OS0: 00000503]: Avg. Burst Period = 125
00:12:28(27.872) [OS0: 00000503]: Tick Count = 125
00:12:28(27.872) [OS0: 00000503]: Memory Swap Count = 0
00:12:28(27.996) [OS0: 00000504]: Avg. Process Waiting Time = 166.23 sec
```

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