CS240
Assignment 7
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Synopsis:

Using the operating system simulator provided, several jobs and processes were written and tested using various parameters. Each job was designed to show a different test case, and then the three algorithms in the OS simulator were applied.

The first test case used four small processes of equal size.
The second test used four larger processes of equal size.
The third test case used four processes of ascending size.
The fourth test case used four processes of descending size.

These cases were each meant to apply different stress to the algorithms to show their various strengths and weaknesses by comparing and contrasting between them. The three algorithms tested were:

Round Robin
- Worst case: Test 2, Processes of size equal or greater than delta.

Shortest Job First
- Worst case: Only has worst case when processes can be given priority.

First Come First Serve
- Worst case: Test 4, Large processes of descending size.

Summary of Results:

From testing, it was obvious that with a short enough program, all algorithms were equally effective, as shown in results for Test Case 1.

As expected, Round Robin proved the most adaptable, though in these tests where priority order of execution does not matter, Shortest Job First proved faster overall. In Test Case 2, Round Robin was shown to have the greatest performance issues by comparison on processes of equal size that have no priority, as being forced to switch when it is not needed slows down the overall execution.

Test Case 3 showed how the Round Robin algorithm was able to nearly match SJF in processes that had ideal order. This would be a benefit over SJF when dealing with jumbled or prioritized processes, depending on the delta used for the RR.

Also a result of the lack of priority, First Come First Serve matched the performance of SJF in most situations, except in Test Case 4, large processes of descending size. As FCFS first ran the largest processes, it was much slower than even Round Robin.

Test results include the time of creation and the time of dispatch for each process. This is shown as an overlap at certain times, occurring when a process is dispatching while another one is being halted.

Test Case 1 (Small processes of equal size):

Algorithm 1 Round Robin:

Time	0	1	2	3	4	5	6
Process 1							
Process 2							
Process 3							

Summary of RR Process Statistics:

PID	Run Time	Ready Time	Total Time
1	2	0	2
2	2	2	4
3	2	4	6

Average Run Time: 2.00
Average Ready Time: 2.00
Average Total Time: 4.00

Algorithm 2 Shortest Job First:

Time	0	1	2	3	4	5	6
Process 1							
Process 2							
Process 3							

Summary of SJF Process Statistics:

PID	Run Time	Ready Time	Total Time
1	2	0	2
2	2	2	4
3	2	4	6

Average Run Time: 2.00
Average Ready Time: 2.00
Average Total Time: 4.00

Algorithm 3 First Come First Serve:

Time	0	1	2	3	4	5	6
Process 1							
Process 2							
Process 3							

Summary of FCFS Process Statistics:

PID	Run Time	Ready Time	Total Time
1	2	0	2
2	2	2	4
3	2	4	6

Average Run Time: 2.00
Average Ready Time: 2.00
Average Total Time: 4.00

Test Case 2 (Large processes of equal size):

Algorithm 1 Round Robin:

t	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
P1																							
P2																							
P3																							
P4																							

t	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
P1																						
P2																						
P3																						
P4																						

Summary of RR Process Statistics:

PID	Run Time	Ready Time	Total Time
1	11	30	41
2	11	31	42
3	11	32	43
4	11	33	44

Average Run Time: 11.00
Average Ready Time: 31.00
Average Total Time: 42.00

Algorithm 2 Shortest Job First:

t	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
P1	■	■	■	■	■	■	■	■	■	■	■	■											
P2	■											■	■	■	■	■	■	■	■	■	■	■	■
P3	■																						■
P4	■																						

t	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
P1																						
P2																						
P3	■	■	■	■	■	■	■	■	■	■	■											
P4											■	■	■	■	■	■	■	■	■	■	■	■

Summary of SJF Process Statistics:

PID	Run Time	Ready Time	Total Time
1	11	0	11
2	11	11	22
3	11	22	33
4	11	33	44

Average Run Time: 11.00
Average Ready Time: 16.00
Average Total Time: 27.00

Algorithm 3 First Come First Serve:

t	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
P1	■	■	■	■	■	■	■	■	■	■	■	■											
P2	■											■	■	■	■	■	■	■	■	■	■	■	■
P3	■																						■
P4	■																						

t	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
P1																						
P2																						
P3	■	■	■	■	■	■	■	■	■	■	■											
P4											■	■	■	■	■	■	■	■	■	■	■	■

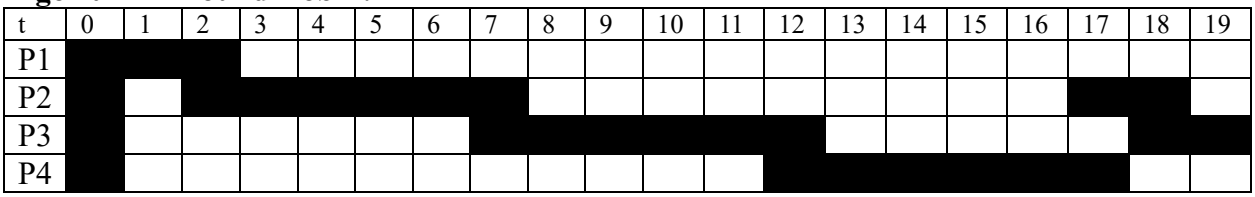
Summary of Process Statistics:

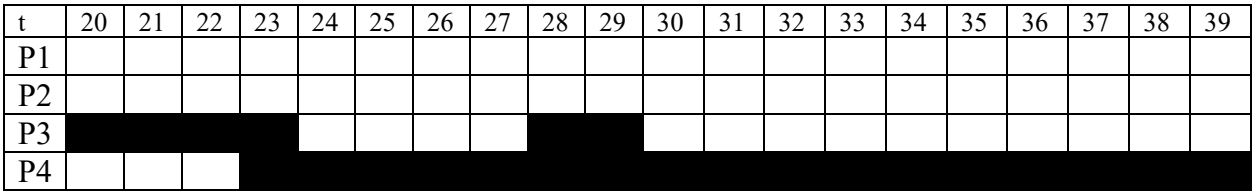
PID	Run Time	Ready Time	Total Time
1	11	0	11
2	11	11	22
3	11	22	33
4	11	33	44

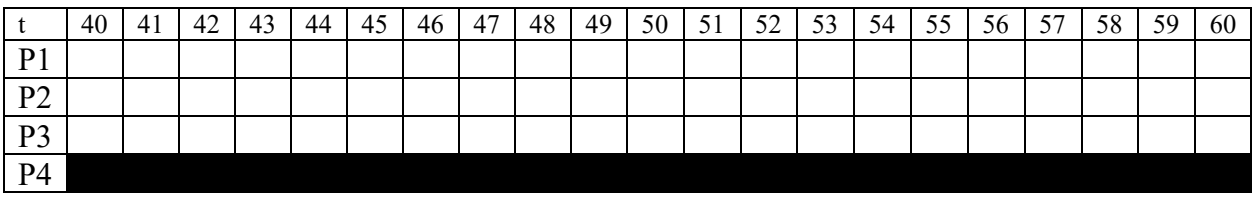
Average Run Time: 11.00
Average Ready Time: 16.00
Average Total Time: 27.00

Test Case 3 (Processes in ascending order of size):

Algorithm 1 Round Robin:







Summary of Round Robin Process Statistics:

PID	Run Time	Ready Time	Total Time
1	2	0	2
2	6	12	18
3	11	18	29
4	41	19	60

Average Run Time: 15.00
Average Ready Time: 12.00
Average Total Time: 27.00

Algorithm 2 Shortest Job First:

t	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
P1	■	■	■																	
P2	■		■	■	■	■	■	■	■											
P3	■								■	■	■	■	■	■	■	■	■	■	■	■
P4	■																			■

t	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
P1																				
P2																				
P3																				
P4	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

t	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
P1																					
P2																					
P3																					
P4	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

Summary of SJF Process Statistics:

PID	Run Time	Ready Time	Total Time
1	2	0	2
2	6	2	8
3	11	8	19
4	41	19	60

Average Run Time: 15.00
Average Ready Time: 7.00
Average Total Time: 22.00

Algorithm 3 First Come First Serve:

t	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
P1	■	■	■																	
P2	■		■	■	■	■	■	■	■											
P3	■								■	■	■	■	■	■	■	■	■	■	■	■
P4	■																			■

t	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
P1																				
P2																				
P3																				
P4	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

t	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
P1																					
P2																					
P3																					
P4	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

Summary of FCFS Process Statistics:

PID	Run Time	Ready Time	Total Time
1	2	0	2
2	6	2	8
3	11	8	19
4	41	19	60

Average Run Time: 15.00
Average Ready Time: 7.00
Average Total Time: 22.00

<u>Test Case 4 (Processes in descending order of size):</u>

Algorithm 1 Round Robin:

t	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
P1	■	■	■	■	■	■												■	■	■
P2	■					■	■	■	■	■	■									
P3	■										■	■	■	■	■	■				
P4	■															■	■	■		

t	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
P1	■	■	■						■	■	■	■	■	■	■	■	■	■	■	■
P2			■	■	■	■	■	■						■	■					
P3								■	■											
P4																				

t	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
P1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
P2																					
P3																					
P4																					

Summary of RR Process Statistics:

PID	Run Time	Ready Time	Total Time
1	41	19	60
2	11	23	34
3	6	22	28
4	2	25	17

Average Run Time: 15.00
Average Ready Time: 19.00
Average Total Time: 34.00

Algorithm 2 Shortest Job First:

t	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
P1	■	■	■																	
P2	■		■	■	■	■	■	■	■											
P3	■								■	■	■	■	■	■	■	■	■	■	■	■
P4	■																			■

t	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
P1																				
P2																				
P3																				
P4	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

t	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
P1																					
P2																					
P3																					
P4																					

Summary of SJF Process Statistics: Summary of RR Process Statistics:

PID	Run Time	Ready Time	Total Time
1	41	19	60
2	11	8	19
3	6	2	8
4	2	0	2

Average Run Time: 15.00
Average Ready Time: 7.00
Average Total Time: 22.00

Algorithm 3 First Come First Serve:

t	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
P1																				
P2																				
P3																				
P4																				

t	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
P1																				
P2																				
P3																				
P4																				

t	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
P1																					
P2																					
P3																					
P4																					

Summary of FCFS Process Statistics:

PID	Run Time	Ready Time	Total Time
1	41	0	41
2	11	41	52
3	6	52	58
4	2	58	60

Average Run Time: 15.00
Average Ready Time: 37.00
Average Total Time: 52.00