CISC 3595/5595 — Operating System
Spring, 2016

Homework Assignment #5

Some of the questions are taken from the textbook, Operating Systems, Principles and Practice, by T. Anderson and M. Dahlin.

1 (Question 35, Page 172) Measurement of a certain system have showns that the average process run for a time T before blocking on I/O. A process switch requires a time S, which is effectively wasted (overhead). For round-robin scheduling with quantum Q, give a formular for the CPU effeciency for each of the following:

(a) $Q = \infty$
(b) $Q > T$
(c) $S < Q < T$
(d) $Q = S$
(e) Q nearly 0, i.e., Q is very small

2 (Question 37, Page 173) For batch jobs A through E, arrive at a computer center at almost the same time. They have estimated running times of 10, 6, 2, 4, and 8 minutes. Their (externally determined) priorities are 3, 5, 2, 1 and 4, respectively, with 5 being the highest priority. For each of the following scheduling algorithms, determine the mean process turnaround time. Ignore process switching overhead.

(a) Round Robin
(b) Priority scheduling
(c) First-come, first-served (run in order 10, 6, 2, 4, 8)
(d) Shortest job first

For Round robin, assume that the system is multiprogrammed, and that each job gets its fair share of the CPU. For the other three, assume that only one job at a time runs, until it finishes. All jobs are completely CPU bound.

3 Fill in the following table which compares the performance of several single CPU scheduling algorithms, and notes the reasons. (Fill in descriptive words such as *optimal*, *can be worst*, *average*, *balanced*.

Schemes	Average Response time	Throughput	Fairness	Starvation
FIFO				
Shortest Job First				
Round Robin				
Multi-level Feedback Queue				

4 Given the following mix of tasks, task length, and arrival times, compute the completion and response time for each task, along with the average response time for the FIFO, RR, and SJF algorithms. For the RR, we can assume the time quantum is 10 milliseconds and that all times are in milliseconds.

Task	Length	Arrival Time	Completion Time	Response Time
0	85	0		
1	30	10		
2	35	15		
3	20	80		
4	50	85		
		Average		

5 Three tasks, A, B and C are run concurrently on a computer system.

- Task A arrives first at time 0, and uses the CPU for 50 ms before finishing.
- Task B arrives shortly after A, still at time 0. Task B loops 4 times; for each iteration of the loop, B uses the CPU for 2 ms and then it does I/O for 8 ms.
- Task C is identical to B, but arrives shortly after B, still at time 0.

Assuming there is no overhead to doing a context switch, identify when A, B and C will finish for each of the following CPU scheduling disciplines.

(a) First-Come-First-Serve

(b) Round robin with a 1ms time slice

(c) Round robin with a 100ms time slice

(d) Multilevel feedback with four levels, and a time slice for the highest priority level is 1ms

(e) Shortest job first