CMPSCI 377: Operating Systems

Homework 2: Threads, Scheduling and Synchronization

Due: October 17, 2000, in class

1. (10 pts) **Threads** What are the differences between user-level and kernel-level threads? Under what circumstances is one type better than the other?

2. (10 pts) **Scheduling.** Given the following mix of job, job lengths, and arrival times, assume a time slice of 10 and compute the completion and average response time of each job for the FIFO, RR, and SRTF algorithms. Please use the following table format for your solution.

			Scheduling Algorithms		
Job	length	arrival time	FIFO	RR	SRTF
0	75	0			
1	40	10			
2	25	10			
3	20	80			
4	45	85			
		Avg. RT			

3. (10 pts) **Scheduling.** Given 3 jobs of length 10, 30, and 25 seconds with the same arrival time, schedule them in job number order. The 10 sec job has 1 sec of I/0 every other sec starting at 1 second (assume the I/O happens just before the time slice ends). The context switch time is 0 sec, and there are 2 queues. The first has 1 sec time slice; the second has a 2 sec time slice. Using the Multilevel Feedback Queues Algorithm, fill in the following tables with the average response, execution, and completion times of these jobs (assume that a higher priority job that wakes up does not preempt a currently running lower-priority task). Use the notation from class: make the superscript on the job number the progress of the job, and the subscript on the job number the system time. For comparison, also compute the job completion and average response times for the RR algorithm.

		Completion Time	
Job	length	RR	MLFB
1	10		
2	30		
3	25		
avg. RT			

Queue	Time Slice	Job
1	1	
2	2	

4. (10 pts) **Semaphores** Suppose a building has a limit on the number of people that may be in the building at one time due to a fire code. Suppose this is a very popular place to visit, so the number of people inside must be monitored closely. Further, suppose that this building has more than one entrance and exit. Construct an algorithm that could be used to control a set of turnstiles that would ensure that the room was allowed to be filled but was never allowed to exceed its legal capacity.

5. (10 pts) **Locks** If you were an OS designer implementing locks, would you implement them using test&set or by disabling interrupts? Why?