CSC 4100 Exam #1 Name:_____
02/08/2021

Describe the three primary process states and how they interact. (**10 points**)

List the steps required to turn a **program** into a **running process** (the process is immediately scheduled). Start with what happens on a call to **fork**. (**5 points**)

What does "**amortize**" the cost of a context switch mean? (**10 points**)

Why might processes that perform **I/O** be scheduled before other processes? (**10 points**)

Explain how the issue of process starvation is addressed in an MLFQ scheduler. (**10 points**)

How does the Linux Completely Fair Scheduler **locate** the process to run next (assume all processes have the same priority)? (**5 points**)

Process A arrives at time t=0 ms and requires 20 ms to complete, process B arrives at time t=7 and requires 15 ms to complete, and process C arrives at t=9 and requires 5 ms to complete. Compute the average **turnaround time** and the average **response time** assuming the OS is using **Round Robin** for scheduling. The timer interrupt is set to 5 ms, so a preempt can only occur in a multiple of 5 ms. (**20 points**)
Ignore the "cost" of a context switch. Break ties alphabetically.

Assume there are 3 queues for an MLFQ scheduler. The timer is set to 50 ms. Process A arrives at t=0 ms and will use the CPU for a total of 150 ms. Process B arrives at t=100 ms and will use the CPU for a total of 100 ms. Process C arrives at t=150 ms and will use the CPU for 25 ms, issue an I/O request that takes 50 ms to complete, then use the CPU for another 75 ms. Show how these three processes are scheduled using a diagram similar to those in the textbook and in class. Label your rectangles A, B, or C, depending on which process it represents.
Assume no priority boost and that a process moves down in priority when its **accumulated runtime** equals the timer interval of 50 ms. (**25 points**)

Processes A, B, C, and D have 100, 400, and 300, and 300 tickets, respectively Show how the next process to schedule is determined by the **lottery** technique. The random number generated for this purpose is **781**. Show each step.
How could you improve the efficiency of this algorithm? (**15 points**)