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Exam #2

Monday 5 November 2007

1. All of the threads in a process share the same program code, yet each requires storage for its own Program Counter value in its Thread Control Block. Explain. (8 points)

2. Which would be better suited for implementing a server process that is expected to handle multiple users simultaneously — user-level or kernel-level threads — and why would that type of threads be better suited? (12 points)

3. Shortest-Job-First (SJF) and Shortest-Remaining-Time (SRT) are two related CPU
    scheduling algorithms.

    a. How do these two algorithms differ with respect to picking the next process to run on the
        CPU? (10 points)

    b. How do these two algorithms differ with respect to their treatment of processes with a
        long CPU burst? (10 points)

4. Why do we care so much about processes with a short CPU burst and want to develop CPU
    scheduling algorithms that give preferential treatment to those processes? (5 points)

5. Consider a semaphore S that is initialized to 1, and a critical region protected by that semaphore.

   a. What happens when process A calls the P operation on that semaphore (answer in terms of the value of the semaphore S and the effect on process A or any other process)? (5 points)

   b While process A is in the critical region, what happens when process B calls the P operation on that semaphore (answer in terms of the value of the semaphore S and the effect on process B or any other process)? (5 points)

   c. While process A is still in the critical region, what happens when process C calls the P operation on that semaphore (answer in terms of the value of the semaphore S and the effect on process C or any other process)? (5 points)

   d. What happens when process A leaves critical region and calls the V operation on that semaphore (answer in terms of the value of the semaphore S and the effect on process A or any other process)? (5 points)

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6. In the Coke machine bounded-buffer produce-consumer problem using semaphores, what operations are performed on counting semaphore emptySlot, which was initialized to 100? (10 points)

7. Deadlock can be prevented if the "mutual exclusion" criterion can be avoided. Explain how printer spooling can avoid mutual exclusion and thus prevent deadlock from occurring. (10 points)

8. When deadlock is detected in a system, the deadlock can be detected by terminating a process. How is the process to be terminated selected? (15 points)