



You may use one side of one 8.5×11 inch sheet of paper. This sheet should be turned in with your exam. Be sure to *read each problem carefully*. You should answer all seven questions. Note: The exam is double-sided.

1. (7 points) What is the main advantage of the microkernel approach to system design?

2. (7 points) Explain the concept of transaction atomicity.



3. (14 points) Describe the actions taken by a kernel to switch context between processes.



4. (12 points) Some early computers protected the operating system by placing it in a memory partition that could not be modified by the user job or the operating system itself. Describe two difficulties that you think could arise with such a scheme.



5.

(a) (8 points) Give two scenarios where multithreading would improve performance over a single-threaded solution.

(b) (8 points) Give two scenarios where multithreading would **not** improve performance over a single-threaded solution.

6. Consider the following preemptive priority-scheduling algorithm based on dynamically changing priorities. Larger priority numbers imply higher priority. When a process is waiting for the CPU (in the ready queue, but not running), its priority changes at a rate of α ; when it is running, its priority changes at a rate of β . All processes are given a priority of 0 when they enter the ready queue. The parameters α and β can be set to give many different scheduling algorithms.

(a) (12 points) What scheduling algorithm is described by $\beta > \alpha > 0$?

(b) (12 points) What scheduling algorithm is described by $\alpha < \beta < 0$?



7. In the second lab assignment, your main application process was required to indicate how each child process terminated.

(a) (5 points) List two ways that the child process could terminate.

(b) (15 points) Describe the C++ constructs used to find out how the child process terminated. I.e., what functions are used and what is their interface?