

Exam 1 (2/11/2000)

Longer answers are not necessarily better. Write legibly.

1. (15%) Can multi-threading result in better performance on a uniprocessor machine? If so, give a specific example (e.g., a scenario under which a workload can be executed twice as fast). If not, explain why not.
2. (10%) What does it mean for a function or system call to be *async safe*? What is the potential problem with functions that are not async safe? (Hint: a synonym for “async safe” is “signal safe”.)
3. (40%) Consider the following synchronization problem: An application has two kinds of threads, red and green. A critical section can be executed by up to three threads, not all of them the same color (i.e., at most 2 red and 1 green, or 2 green and 1 red). Show the synchronization code of a green thread (i.e., the synchronization variables, as well as what a green thread needs to do before entering the critical section, and what it needs to do after leaving it).
4. (15%) What is the many-to-one model for thread libraries? Describe briefly its advantages and disadvantages.
5. (20%) How can a threads library handle different signal masks for each thread, without kernel support? That is, how can different threads choose independently which asynchronous signals to handle, although the kernel signal masks are per-process?