CIS415 * Spring 2006

Homework 1
Synchronization and Memory Management
Due: Monday, May 22nd, 2006.

Note: word process your homework

Synchronization

a. Show that, if the wait() and signal() semaphore operations are not executed atomically, then mutual exclusion may be violated.

b. Show how to implement the wait() and signal() semaphore operations in multiprocessor environments using the TestAndSet() instruction. The solution should exhibit minimal busy waiting.

c. Explain why implementing synchronization primitives by disabling interrupts is not appropriate in a single-processor system if the synchronization primitives are to be used in user-level programs.

Memory management

a. Discuss the hardware support required to support demand paging.

b. Assume that we have a demand-paged memory. The page table is held in registers. It takes 8 milliseconds to service a page fault if an empty frame is available or if the replaced page is not modified and 20 milliseconds if the replace page is modified. Memory-access time is 100 nanoseconds. Assume that the page to be replaced is modified 70 percent of the time. What is the maximum acceptable page-fault rate for an effective access time to no more than 200 nanoseconds?

c. Suppose that your replacement policy (in a paged system) is to examine each page regularly and to discard that page if it has not been used since the last examination. What would you gain and what would you lose by using this policy rather than LRU or second-chance replacement?