COMP SCI 3004/7064 Operating Systems

Tutorial II-c

1. Show that if the *wait* and *signal* operations are not executed atomically, then mutual exclusion may be violated.

2. *The Cigarette-Smokers Problem:* Consider a system with three *smoker* processes and one *agent* process. Each smoker continuously rolls a cigarette and then smokes it. But to roll and smoke a cigarette, the smoker needs three ungreduents: tobacco, paper, and matches. One of the smoker processes has paper, another has tobacco, and the third has matches. The agent has an infinite supply of all three materials. the agent places two of the ingredients on the table. The smoker who has the remaining ingredient then makes and smokes a cigarette, signaling the agent on completion. The agent then put out another two of the ingredients, and the cycle repeats. Write a program to synchronize the agent and the smokers.

3. Demonstrate that monitors, conditional critical regions, and semaphores are all equivalent, insofar as the same types of synchronization problems can be implemented with them.

4. Consider a system consisting of processes P_1, P_2, ..., P_n, each of which has a unique priority number. Write a monitor that allocates three identical line printers to these processes, using the priority numbers for deciding the order of allocation.