

CS414 Homework #3

Due February 28, 2008

1. Consider two processes: Gilbert and Shoe, and three reusable resources: a bathroom (which is large enough for only 1 person), a single copy of magazine X, and a single copy of magazine Y.

The Gilbert process behaves as follows:

```
get magazine Y
get magazine X
release Y
get bathroom
release X
release bathroom
```

The Shoe process behaves as follows:

```
get magazine X
get magazine Y
release X
release Y
get bathroom
release bathroom
```

Each process is asynchronous and repeats its behavior cycle indefinitely.

- (1) Using semaphores, implement appropriate synchronization for these processes in a multiprogramming environment. Try to achieve the highest utilization of each resources. You are not allowed to change the order in which any operations are performed (they are very stubborn). The resulting system must be deadlock free.
- (2) Show that your solution implements mutual exclusion with respect to the magazine X.
- (3) Outline an informal argument that deadlock is not possible in your solution.

2. A barbershop consists of 5 waiting chairs and 1 barber chair. If there are no customers to be served, the barber keep waiting for the customer. If a customer enters the barbershop and all chairs are occupied (which happens almost always on Saturdays), then the customer leaves the shop in disgust. If the barber is busy, then the customer sits in one of the available free chairs and wait until the barber is free. Write a program to coordinate the barber and the customers using semaphores. Explain all the assumptions and give an example to show that your solution works correctly.

No hand-written homework! Pledge your homework.