CS4410 - Fall 2008
Homework 3
Due October 7, 11:59PM

Q1. A single-lane bridge connects the two Vermont villages of North Tunbridge and South Tunbridge. Farmers in the two villages use this bridge to deliver their produce to the neighboring town. The bridge can become deadlocked if both a northbound and a southbound farmer get on the bridge at the same time (Vermont farmers are stubborn and are unable to back up).

a. Using exactly one semaphore, design an algorithm that prevents deadlock. Do not be concerned about starvation and inefficiency.

b. Provide a solution using Monitor that is starvation-free.

Q2. If the P() and V() semaphore operations are not executed atomically, then can mutual exclusion be violated? Why or why not?

Q3. Consider the following snapshot of a system:

	Allocation	*Max*	*Available*
	A B C D	A B C D	A B C D
P_0	0 0 1 2	0 0 1 2	1 5 2 0
P_1	1 0 0 0	1 7 5 0	
P_2	1 3 5 4	2 3 5 6	
P_3	0 6 3 2	0 6 5 2	
P_4	0 0 1 4	0 6 5 6	

Answer the following questions using the banker's algorithm:

a. What is the content of the matrix Need?

b. Is the system in a safe state?

c. If a request from process P_1 arrives for (0,4,2,0), can the request be granted immediately?

Q4. Consider a system consisting of four resources of the same type that are shared by three processes, each of which needs at most two resources. Is this system deadlock-free? Why or why not?

Q5. Given five memory partitions of 100 KB, 500 KB, 200 KB, 300 KB, and 600 KB (in order), how would each of the first-fit, best-fit, and worst-fit algorithms place processes of 212 KB, 417 KB, 112 KB, and 426 KB (in order)?Which algorithm makes the most efficient use of memory?