CS 385: HW2–Due 17 Oct

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1. Interleavings. Describe the possible outcomes, assuming each variable holds as its initial value 0.

   (a)

load i into register r	load i into register r
r = r + 3	r = r + 2
store r into i	store i into r

   (b)

load j into register r	load i into register r
r = r + 3	r = r + 2
store r into j	store i into r

   (c)

load j into register r	load i into register r
store r into i	r = r + 2
r = r + 3	store i into r
store r into j	

2. Interference.

   (a) Under what conditions does writing a[i] interfere with writing a[j]. Explain.

   (b) Under what conditions does writing *p interfere with writing *q. Explain.

   (c) Consider an atomic operation $x+=2$. Does this interfere with another execution of the same operation on the same variable. Explain.

3. Use one or more semaphores to implement the linked list operations insert, find, and delete.

4. Implement using semaphores a stack with operations push and pop.

5. Consider an atomic operation fetchAndAdd(*ptr,c) which returns increases *ptr by c. Show how a critical section could be implemented using this instead of testAndSet.

6. What are the advantages/disadvantages of using testAndSet directly vs. using a semaphore?

7. Consider a money lending machine which has eight \$5 bills and twenty \$1 bills. A user can request to borrow any amount up to \$20 and then before borrowing more must repaying the amount borrowed. Write borrow and repay routines using semaphores.

8. Consider a sequencing mechanism in which after i executes, there can be 4 processes which execute j. This should be repeatable, that is every time i is executed j can be executed another 4 times.

9. In the readers-writers problem, what happens if the arrival of readers is very high for the solution in the notes? Can you rewrite readers-writers problem so that this does not occur?

10. Given the below computations, which would be classified as readers and which would be classified as writers if the below was all the concurrent code:

    - $v++$
    - $s+=5$
    - if (v) $q=17$
    - if (v! =0) $v=0$