CSI 4337 **Exam #2** **Nov. 1, 2004**

STUDY SHEET

1. Suppose the following two statements are executed simultaneously by two processes with no protection. The value of S is 10 before the statements are executed. What are the possible final values, and how can each occur?

shared int S = 10;

Process 1	Process 2
…	…
S = S + 6;	S = S - 8;
…	…

2. What are the three requirements for any synchronization system for protecting shared variables? Explain each.
3. Given two processes P1 and P2, and a shared variable S, show how to protect this variable using semaphores.
4. Given two processes, each of which have a critical section with respect to a variable Q, show how to protect these critical sections **TestAndSet** instructions and semaphores.

5. Using two semaphores S1 and S2, show how a deadlock can occur between two processes, even if the semaphores are used correctly.
6. List the five conditions necessary for deadlock.
7. Is the following system safe?

	Has				Max				Free			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	3	0	1	1	1	1	0	0	1	0	2	0
P1	0	1	0	0	0	1	1	2				
P2	1	1	1	0	3	1	0	0				
P3	1	1	0	1	0	0	1	0				
P4	0	0	0	0	2	1	1	0				

8. Is the following system deadlocked?

	Has				Req				Free			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	3	0	1	1	0	0	0	0	1	0	2	0
P1	0	1	0	0	0	1	1	1				
P2	1	1	1	0	3	1	0	0				
P3	1	1	0	1	2	0	1	0				
P4	0	0	0	0	2	1	1	0				

9. Is the following system deadlocked?

	Has				Max				Free			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	3	0	1	1	0	0	0	0	1	0	1	0
P1	0	1	0	0	0	1	1	1				
P2	1	1	1	0	3	1	0	0				
P3	1	1	0	1	0	0	1	2				
P4	0	0	0	0	2	1	1	0				

10. Assume you have a decimal machine with both virtual and physical addresses consisting of 4 digits. The page number is two digits and the offset is two digits. Given the following page table, translate the given virtual addresses into real addresses. If a virtual address can't be translated, write "page fault" for the real address. The page table is 12 entries long.

Page Table

35xx
52xx
61xx
70xx
32xx
01xx
11xx
45xx
60xx
59xx
91xx
22xx

Virtual	Real
0121	
3241	
0715	
1237	
0977	
1192	
1066	
0256	
0621	
0599	