COSC 4330 FINAL EXAMINATION MAY 11, 2005

This exam is closed book. You can have one page of notes. UH expels cheaters.

1. Wolves and Sheep: A park ranger has to manage an area that can contain either wolves or sheep, but not both at the same time as the wolves would eat the sheep. You are hired to help him to write four procedures ensuring (a) that no wolf will enter the area when sheep are present and (b) that no sheep will do the same when wolves are present.

Complete the skeleton of the **two** procedures **enter_sheep()** and **exit_sheep()**. Don't worry about potential starvation conditions. $(4 \times 5 \text{ points})$.

	semaphore as semaphore si semaphore we int sheepcor int wolvesce	<pre>dmit = 1; heepmutex = 1; olvesmutex = 1; unt = 0; ount = 0;</pre>	
(void) enter_sheep()	{	<pre>void) exit_sheep(){</pre>	
P(&sheepmutex);		P(&sheepmutex);	
sheepcount++	_;	sheepcount	_;
if (sheepcount == 1))	if(sheepcount == 0)	
P(&admit);	:	V(&admit)	;
V(&sheepmutex);		V(&sheepmutex);	
} // enter sheep		} // exit sheep	

- **2.** Complete the following sentences: (4×5 points)
 - (a) The page table organization that has one page table entry per page frame is called inverted page tables______
 - (b) The cost of a TLB miss handled by the system's *microcode* is one additional memory access ______
 - (c) The page replacement policy of Berkeley UNIX simulates a non-existent page-referenced bit ______ using the valid bit ______ bit.
- **3.** A computer has 32 bit addresses, 20 of which are used for the page number. What is the *page size*? (5 points)

2¹² or 4K bytes

4. Why should you always put an **if** or a **while** statement before any **wait** operation in your monitor code? (5 points)

Because your monitor procedure could otherwise wait forever.

- **5.** A 32-bit Berkeley UNIX file system has a block size of 8 kilobytes. How many *blocks* of a given file can be accessed :
 - (a) Using the block addresses stored in the i-node? (5 points) **12**_____**blocks**
 - (b) With one level of indirection? (5 points) $8K/4 = 2,048 \text{ or } 2^{11}$ blocks
 - (c) With two levels of indirection? (5 points) 4G/8K 2K 12 or 512K 2K 12 blocks

Explain in one line or less your answer to point (c) above. (5 points)

File size is limited to 2³² bytes or 4G bytes _____

- 6. True or False: $(10 \times 2 \text{ points}; \text{ no penalty for incorrect answers})$
 - **T F X** Monitor conditions can only have positive values.
 - **T**_X **F**_____ It is easier to eliminate a *circular wait* condition than an *hold and wait* condition.
 - **T F X** The LRU policy always expels the page that has been in memory for the longest period of time.
 - **T** $_$ **F** $_$ **X** The TLB is normally stored in the main memory.
 - **T**_X **F**____ The VMS page replacement policy is tailored to the needs of *real-time processes*.
 - **T**_X **F**____ VMS stores the page tables of user processes in *virtual memory*.
 - **T F X** A good page fault rate for a virtual memory system is one page fault every one thousand to two thousand references.
 - **T F X** We can prevent deadlocks in message-passing systems by denying the mutual exclusion condition..
 - **T F X** The *valid bit* indicates which pages must be *written back to disk* when they are expelled.
 - **T**_X **F**____ All problems that can be solved using *semaphores* can also be solved using *monitors*.
- 7. Consider a UNIX file called mystery.txt

-rw-r---- 1 alice ssrg 29 May 5 19:07 mystery.txt and assume that the group ssrg contains the users alice, bob, carol and dean.

- (a) Which access rights are granted to **alice**? (5 points) read and write
- (b) Which access rights are granted to carol? (5 points) read_____