COSC 4330	FINAL	JULY 11, 2003

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

1. *Answer the following questions in one or, at most, two sentences:* (6×5 points)

a) What is the difference between a *signal* and a *notify*?

A monitor procedure issuing a notify never loses the control of the monitor before it is done while a process issuing a signal will loses it if there is another monitor procedure waiting on the condition that was signaled.

b) What is the function of the *missing bit*?

To indicate whether a given page is in memory (bit = 0)) or not (bit = 1).

c) What is the purpose of the **`lseek()`** system call?

To modify the location of the current position within a given file, thus allowing random access within a file.

d) When does *thrashing* happen in a virtual memory system?

When there are too many processes in main memory and the system spends most of its time shuffling pages between the disk and the main memory.

e) What is the sole disadvantage of *simulating* a *page-referenced bit* by software?

Two context switches every time a page is accessed after is page-referenced bit was reset to zero.

f) Give an example of a *consumable resource*?

Answer: a message

2. Assuming that all files in a disk partition are exactly 9 kilobyte in size and the block size is 4 kilobytes, how much disk space will be lost due to *internal fragmentation*? (5 points)

Answer: 25 percent

3. A Berkeley UNIX file system has a block size of eight kilobytes. How many blocks, *including indirection blocks*, will it allocate for a 8-megabyte file? (5 points)?

Answer: 1,025 **block(s)**

4. Which features are shared by the Mach and VMS page replacement policies? (5 points) How do they differ? (5 points)

Both page replacement policies use FIFO but put the victims of the FIFO policy at the end of a global queue that contains pages waiting to be expelled and from where pages can be reclaimed. The VMS page replacement policy allocates a specific number of page frames to each process while the Mach policy manages a single pool of page frames shared by all processes.

5. What is the difference between *starvation* and *deadlock*? (4 points) Does one necessarily imply the other? (2×3 points)

Starvation means that one or more processes are not making any progress while deadlock implies that there are several processes that are blocked. Deadlocks always occasion the starvation of the deadlocked processes but starvation does not require the presence of a deadlock in the system.

6. Consider the following solution to the mutual exclusion problem:

```
shared int reserved[2] = {0, 0};  // global

void enter_region(int pid) { // pid MUST be 0 or 1
       while (reserved[1 - pid]);
       reserved[pid] = 1;
   } // enter_region

void leave_region(int pid) {
       reserved[pid] = 0;
   } // leave_region
```

What is wrong with it? (5 points) When does this problem occur? (5 points)

Mutual exclusion will be denied if two processes want to enter the same critical section at the same time and execute the statements of enter_region(…) in lockstep.

7. Assuming that the default group of your Bayou account is the group **`cosc4330`**, which access rights are you granting to whom when you create a shared memory segment with the flag 0640? (3×5 points)

Hint: Think in octal.

The owner of the file **will be granted** read and write **access**

The members of cosc 4330 **will be granted** read **access**

All other users **will be granted** no **access**

8. Give two methods for handling TLB misses (2×5 points) and compare their performances. (5 points).

TLB misses can be handled by firmware of y software. The first solution requires one additional memory access per TLB miss while the second requires two context switches per TLB miss.