COSC 4330 FINAL EXAMINATION JULY 16, 2004

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

1. For each of the statements below, indicate in one sentence whether the statement is true or false (2 points), **and why** (3 points).

(a) *Monitor conditions* should always be initialized to zero.

FALSE, monitor conditions have no value.

(b) Messages are one example of *reusable resources***.**

FALSE, they are consumable resources.

(c) A UNIX file can have several names.

TRUE, this will happen whenever several directory entries point to the file inode.

(d) Many good programmers prefer to put all their *signal* operations at the end of their monitor procedures.

TRUE, it ensures that they will never lose control of the monitor while their functions are inside a critical section.

(e) Deadlocks cannot happen without a *hold-and-wait condition*.

TRUE, all four of Haberman's necessary conditions must apply.

(f) The *memory management unit* is one of the most important parts of the UNIX kernel.

FALSE, it is a piece of hardware.

2. Are the following statements true or false for the three following page replacement policies? (5 points per correct line; no partial credits)

This page replacement policy	***VMS***	***Mach***	***Berkeley Clock***
Was designed to handle *real-time processes*.	**T X F __**	**T __ F X**	**T __ F X**
Is compatible with most existing architectures.	**T X F __**	**T X F __**	**T X F __**
Simulates a page-referenced bit by software.	**T __ F X**	**T __ F X**	**T X F __**
Is well known for its *excessive overhead*.	**T __ F X**	**T __ F X**	**T __ F X**

3. A virtual memory system has 32-bit addresses and a page size of 8 kilobytes.

(a) How many *bits* of the virtual address will remain unchanged during the address translation? (5 points)

$\log_2 8{,}096 = 13$ **bits**

(b) What is the maximum number of *pages* a process can have? (5 points)

$2^{32}/2^{13} = 2^{19}$ **pages**

4. Explain why a page fault rate of one page fault every 1,000 references is unacceptable while a TLB miss rate of one TLB miss every 500 references is very good. (2×5 points)

Page faults are much more costlier than TLB misses because a [age fault will require a disk access while a TLB miss will require at most two context switches.

5. ***Short Questions.*** (5 points each)

(a) What is the main advantage of the UNIX implementation of *access control lists*?

They are very small and can thus be stored in the file inode.

(b) What is the function of the UNIX *lseek()* system call?

It moves the current offset within a file.

(c) What is the main advantage of *inverted page tables*?

They are much smaller than conventional page tables.

(d) What is the main advantage of *global page replacement policies* over *local fixed-size page replacement policies*?

They do not allocate a fixed number of page frames to each process.

(e) What does the BSD file system do to reduce *internal fragmentation*?

They store small files and the trailing bytes of larger files into block fragments.

(f) What is the purpose of the *group ID* of a UNIX file?

It specifies the group to which the file belongs.