COSC 4330 FINAL EXAMINATION JULY 2, 2002

This exam is closed book. You can have one page and half of notes. Cheaters will be expelled from UH.

- **1.** Answer the following questions in one or at most two sentences: (4×5 points)
 - a) Give one good reason why the *notify* primitive has replaced the *signal* primitive in several implementations of monitors.

The notify primitive has replace the signal primitive because programmers can put notify everywhere in their procedure code without ever risking to lose control of the monitor.

b) What is the main function of the *TLB*?

The main function of the TLB (translation lookaside buffer) is to speedup the translation of virtual addresses into physical addresses.

c) What is the major advantage of *very large block sizes* in file systems?

Very large blocks reduce the number of I/O operations and speed up all data transfers between the main memory and the disk(s).

d) Is it always possible to deny the *circular wait condition* in computer systems?

No, especially in distributed systems, because it would require all ,essages to move in the same direction: clients would remain able to send requests to servers but servers could not reply to them.

2. A computer has one Gigabyte of main memory, 32 bit addresses and a page size of eight kilobytes. $(4 \times 5 \text{ points})$

a)	How many <i>page frames</i> are there in main memory? $2^{30}/2^{1}$	³ = 2 ¹⁷ 128K frames
b)	How many bits of the virtual address are taken by the <i>page number</i>	·? <u>32 - 13= 19</u> bits
c)	How many bits of the physical address are taken by the <i>byte offset</i> ?	<u>13</u> bits

d) On the average, how much memory is lost to *internal fragmentation*?

half a page frame(s) per process

- **3.** A Berkeley UNIX file system has a block size of eight kilobytes. How many indirect blocks will it allocate: $(2 \times 5 \text{ points})$
 - a) For a 90 kilobyte file? _____0 blocks
 - b) For a one megabyte file? <u>1</u> blocks

<u>Explanation</u>: There are $2^{20}/2^{13}$ = 128 eight kilobyte blocks in a megabyte and each indirect block contains $2^{13}/4$ = 512 block addresses. Thus one indirect block is more than enough.

4. What is the major drawback of the VMS page replacement policy? How does the Windows NT page replacement policy addresses that problem? (2×5 points) *Answers that are not specific will graded on a maximum of 5 points*.

VMS assigns a <u>fixed</u> number of page frames to each process at its creation time. This number is often difficult to estimate correctly, which can cause performance issues.

Windows NT addresses that problem by letting the number of page frames allocated to a process vary between a minimum and a maximum. Overall, processes get more page frames when page frames are plentiful and have to relinquish some of these frames when other processes need them. In addition, the policy monitors process page fault rates and gives more frames to process that would otherwise have too many page faults.

5. Which of the following features apply to either access control lists or tickets (or both)? (4 points out of 20 for each wrong answer)?

Feature	Access Control Lists		Tickets	
Used in the UNIX file system	Y	N	Y	N
Slower of the two	Y	N	Y	Ν
Less flexible of the two	Y	Ν	Y	N
Better for short-term access control	Y	Ν	Y	N
Better for long-term access control	Y	N	Y	Ν

6. A small foot bridge can only carry 8 people at the same time. You are to write two monitor procedures, **go_on()** and **leave()**, that will be called by everybody before going on the bridge and when leaving it. (4 points per correct line)

public void synchronized go_on() {

if (np == 8)

ok.wait;_____

<u>np++;</u>

} // go_on()

public void synchronized leave() {

np--;

ok.signal;

} // leave()

Bridge() {

np = 0;

} // constructor

} // Class Bridge