NAME: _____ (FIRST NAME FIRST) **SCORE:** _____

COSC 4330/6310 THIRD QUIZ MAY 5, 2014

THIS EXAM IS CLOSED BOOK. YOU CAN HAVE ONE PAGE OF NOTES. UH EXPELS CHEATERS.

1. A virtual memory system has 32-bit addresses. Given that 19 of these 32 bits are used by the page number,

(a) How many bits of the address are used by the ***byte offset*** (5 points) 32 – 19 = 13 **bits**

(b) What is the ***page size*** of the system**?** (5 points) 2^{13} = 8K **bytes**

(c) How ***many pages*** are there in a process address space? (5 points) 2^{19} = 512K **pages**

2. Consider a UNIX file called **`project.txt`**

`1784 -rw-r----- 1 bob ssrg 1820900 May 4 09:15 report.txt`

and assume that the group **`ssrg`** contains the users **`alice`**, **`bob`** and **`carol`**.

(a) Which access rights are granted to user **`bob`**? (5 points) read and write

(b) Which access rights are granted to user **`alice`**? (5 points) read only

3. A 32-bit Berkeley UNIX file system has a block size of 4 kilobytes. How many ***blocks—not bytes***—of a given file can be accessed :

(a) Using the block addresses stored in the i-node? (5 points) 12 (that's easy!) **blocks**

(b) With one level of indirection? (5 points) 4KB/4B = 1K = 1,024 **blocks**

(c) With two levels of indirection? (5 points) $(4K/4)^2$ – 1,024 – 12 = 1M -1,036 **blocks**

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

A 32-bit file cannot have more that 1M 4KB blocks.

Detail your computations here for possible partial credit:

Total: _____/40
Check: ____/40

4. ***Questions with short answers:*** (6×5 points)

(a) How can you prevent deadlocks by denying the ***circular wait condition***? _____

We will force all processes to acquire all resources in the same linear order.

(b) Why does the ***Windows*** page replacement policy handle ***real-time*** processes ***better*** than other policies?

Because it assigns a minimum partition size to each process and can make this size large enough to accommodate the whole address space of a virtual process.

(c) Where do UNIX file systems store their ***access control lists***? _____

In the file i-node.

(d) What is the purpose of the ***dirty bit*** in a virtual memory system? _____

To tell whether the page has been modified since the last time it was brought into main memory. o

OR To tell whether the page must be saved in the swap area when it is expelled from main memory.o

(e) What does the Berkeley Fast File System do to reduce ***internal fragmentation***? _____

It allow blocks to be subdivided into fragments whose sizes can be equal to $\frac{1}{2}$, $\frac{1}{4}$ or 1/8 of a block. o

(We speak here of internal fragmentation.)

(f) Why was a ***second hand*** added to the Berkeley page replacement policy? _____

To speed up the expulsion of stale pages without increasing the linear speed of the clock hand(s). o

(It would have resulted in an excessive number of context switches.) o

Total: _____/30

Check: ____/30

5. ***Advantages and disadvantages:*** (6×5 points)

*You will get **no credit** if you mention an advantage instead of and advantage and vice versa.*

(a) What is the main ***disadvantage*** of ***LRU*** page replacement policies?

Its excessively high overhead.

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

Their size is proportional to the size of the system's physical memory instead of the size of the process address spaces.

(c) What is the main ***disadvantage*** of letting the ***kernel handle TLB misses***?

Each TLB miss will occasion two context switches.

(d) What is the ***main advantage*** of ***cylinder groups*** in the Berkeley Fast File System?

They keep the data blocks of each file closer to its i-node thus reducing disk seek times.

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

Setting the page refrenced bit back to one when the page is reaccessed after having the bit was cleared by the clock handle will cost ~~three~~ two context switches.

(f) What is the ***main advantage*** of ***mapped files***?

We eliminate context switches by bringing file blocks directly into the address space of each process that perform a file access.

Total: _____/30
Check: ____/30