NAME: _____ (FIRST NAME <u>FIRST</u>)   **SCORE:** _____

COSC 4330/6310   THIRD QUIZ   JULY 21, 2015

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

1. A cheap laptop has 2 GB of main memory, 32-bit addresses and a page size of 4 KB. (3×5 points)

   a) How many *page frames* are there in main memory?   _____ **frames**

   b) How many bits of the virtual address are taken by the *byte offset*?   _____ **bits**

   c) How many bits of the virtual address are taken by the *page number*?   _____ **bits**

2. The old UNIX Fast File System required all disk writes involving metadata updates to be performed in a *synchronous fashion*. (2×5 points)

   a) Why?   _____

   _____

   _____

   b) What was the *main drawback* of this approach?   _____

   _____

   _____

3. Consider a 64-bit UNIX file system where all block addresses are 8-byte long and file sizes can exceed 4GB. Assuming a 4KB page size, how many file *blocks* could it access: (3×5 points)

   a) With *one level* of indirection?   _____ **blocks**

   b) With *two levels* of indirection?   _____ **blocks**

   c) With *three levels* of indirection?   _____ **blocks**

   You can detail here your computations for possible partial credit.

                                                                            Total: _____/40

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

a) Which page replacement policy supports ***real-time processes***? _____

_____

_____

b) What is the ***main advantage*** of ***journaling file systems*** with ***asynchronous metadata updates***? _____
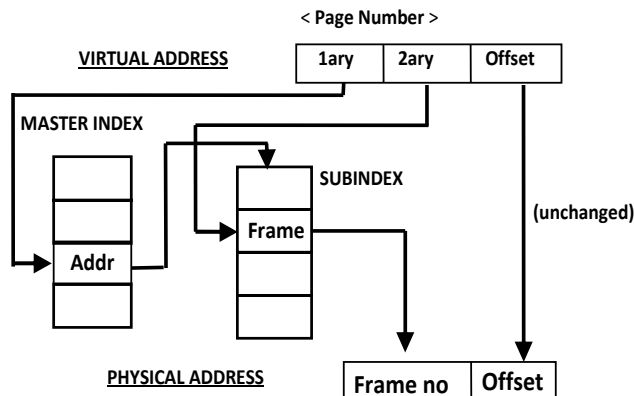
_____

_____

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

_____

_____

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

_____

_____

e) Where do UNIX file systems store ***file names***? _____

_____

_____

f) What is the major disadvantage of ***very large block sizes*** in file systems? _____

_____

_____

Total: _____/30

5. Consider the following multilevel page table organization. It was said in class that that organization was ideally suited to virtual memory systems with 32-bit addresses and 4 KB pages. Why? (5 points)

< Page Number >

VIRTUAL ADDRESS | 1ary | 2ary | Offset

MASTER INDEX

SUBINDEX

Frame

(unchanged)

Addr

PHYSICAL ADDRESS | Frame no | Offset

_____

_____

_____

_____

6. Give examples of an *access control list* and a *ticket* in the UNIX/LINUX file systems? (2×5 points)

a) *Access control list:* _____

b) *Ticket:* _____

7. Consider the classical *BSD clock replacement policy* with a *single hand*. (3×5 points)

a) What happens when the hand of the clock reaches a *valid page*? _____

_____

_____

b) What happens when the hand of the clock reaches a page that was *marked invalid*? _____

_____

_____

c) What happens when a process tries to access a page that was *marked invalid*? _____

_____

_____

Total: _____/30