NAME: VERSION A KEY (FIRST NAME FIRST) **SCORE**: _____

COSC 3360/6310 **THIRD QUIZ** **MAY 8, 2017**

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

1. Complete the following sentences: (10×3 points)

A. A virtual memory page is said to be dirty if it has been ***modified*** since it was brought in main memory.

B. In the Unix/Linux file system, each *directory entry* contains _____ a file name **and** an i-node number (and nothing else) _____

C. The ideal page replacement policy would be as inexpensive to run as Global FIFO _____ and as good at finding the best page to expel as Global LRU _____

D. The page table organization that has one page table entry per page frame is called _____ inverted page tables OR hashed page tables (both answers are good) _____

E. The cost of a TLB miss handled by the system's ***kernel*** is _____ two context switches _____

F. The page replacement policy of Berkeley UNIX simulates a non-existent _____ page-referenced bit using the valid bit. _____

G. When we create a file, we must always create the i-node of the new file _____ before creating the directory entry that points to the file.

2. A computer has 52 bit virtual addresses and a virtual memory with a page size of 4 kilobytes. (2×5 points)

A. How many bits are used by the ***byte offset***? $\log_2 4KB = 12$ **bits**

B. How many bits are used by the ***page number***? 52 - 12 = 40 **bits**

 Total: _____/40

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

- ❖ What is the major disadvantage of selecting a ***large block size*** for a file system? **C**
- ❖ What is the purpose of the valid bit? **M**
- ❖ What is the purpose of the **`lseek(…)`** system call? **E**
- ❖ What is the ***strongest point*** of the ***Mach*** page replacement policy? **N**
- ❖ What is the ***major drawback*** of the ***Windows***/***VMS*** page replacement policy? **D**
- ❖ What makes Unix/Linux ***special file***s special? **Q**

<u>The possible answers are:</u>

A. It does not support real-time processes.
B. It guarantees the durability of metadata updates.
C. It increases internal fragmentation.
D. It is often difficult to find the right resident size of a new process.
E. It repositions the file offset of an opened file.
F. It searches for a specific string in an opened file.
G. It searches for a specific string in a list of files.
H. It speeds up data transfers between the disk and the main memory.
I. It stores small files and the trailing bytes of larger files into block fragments.
J. It supports real-time processes.
K. It tells whether the given page has been properly initialized.
L. It tells whether the given page is clean.
M. It tells whether the given page is in main memory.
N. It works fairly well on a wide range of computer architectures.
O. These files can only be accessed by users having root access.
P. These files contain i-nodes instead of data blocks.
Q. They are names given to hardware devices.

4. Consider a UNIX file called `mystery.txt`

```
-rw-r--r--   1 diana     ssrg       29 May  5 19:07 mystery.txt
```

and assume that the group `ssrg` contains the users `anna`, `brenda`, `carol` and `diana`. (3×5 points)

A. Which access rights are granted to `anna`? read access _____

B. Which access rights are granted to `diana`? read and write access _____

C. Which access rights are granted to users that ***not*** part of the group? read access _____

5. Consider a 64-bit UNIX file system with a block size of 8 kilobytes and 15 block addresses in each i-node. Block addresses now occupy **8 *bytes*** and the maximum size of a file is 2^{64}. How many ***blocks*** of a given file can be accessed : (3×5 points)

A. Using the block addresses stored in the i-node? _____ 12 **blocks**

B. With one level of indirection? _____ 8KB /8B = 1,024 or 1K or 2^{10} **blocks**

C. With two levels of indirection? _____ $(8KB/8B)^2$ = 1,048,576 or 1M or 2^{20} **blocks**