COSC 4330 FINAL EXAMINATION DECEMBER 15, 2003

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

1. Answer in one or two sentences to the following questions (6×5 pts).

a) Give one example of a ***consumable resource*** in a distributed computing system

A message.

b) What is the main disadvantage of letting the OS handle ***TLB misses***?

A TLB miss will be much costlier, as it will require two context switches.

c) What can be done to fight ***external fragmentation***?

Use paging.

d) What is the purpose of the ***dirty bit***?

To keep track of which pages have been modified since they were brought into main memory and must thus be written back to disk when they are expelled from main memory.

e) What is the major advantage of ***tickets*** over ***access control lists***?

It is must faster to check a ticket than to consult an access control list.

f) What are the contents of a ***TLB entry***?

The same as a page table entry plus the page number. That is

1. The page number;
2. The frame number;
3. A valid bit or a missing bit, a dirty bit and so on.

2. Among the five following page replacement policies**:**

Local LRU, ***Global LRU***, ***Berkeley Clock***, ***Mach*** and ***Windows NT***

a) Which one(s)do support ***real-time processes***? (5 pts) Windows NT _____

b) Which one(s) do simulate a ***page-referenced bit***? (5 pts) Berkeley Clock_____

c) Which one(s) are partially based on the ***FIFO policy***? (5 pts) Mach and Windows NT __

3. A computer has 32 bit addresses and a virtual memory with a page size of 2 kilobytes. How many bits are used by the *page number*? (5 pts)

Since page size is 2^{11}, the page number occupies 32 – 11 = 21__**bits**

4. A bicycle rental shop offers fifty unisex bicycles for rent. Add the required pseudocode to the following monitor to ensure the smooth operation of the shop. You may assume that prospective customers will always wait for the next available bicycle. (5×4 pts)

Hint: *You do not have to fill all the blank lines.*

```
Class bicycle_rental {
      private nbikes; // number of available bicycles
      private condition not_empty;

      public void synchronized get_bicycle() {
            if (nbikes == 0) //  very important_____________________
                  not_empty.wait; _____________________________
            leave_deposit_and_ride_bicycle()
            nbikes--; ____________________________________________
            ______________________________________________________
            } // get_bicycle()
public void synchronized return_bicycle() {
            ______________________________________________________
            nbikes++;_____________________________________________
            get_back deposit()
            not_empty.signal; ____________________________________
            ______________________________________________________
      } // return_bicycle()

bicycle_rental() {
            nbikes = 50 _____;
      } // constructor
} // Class bicycle_rental
```

5. A 32-bit Berkeley UNIX file system has a block size of 16 kilobytes. How many ***blocks*** of a given file can be accessed :

a) Using the block addresses stored in the i-node? (5 pts) _____ 12 **blocks**

b) With one level of indirection? (5 pts) _____ 16KB/4B= 4,096 **blocks**

c) With two levels of indirection? (5 pts) 4GB/16KB – 4,096 –12 = 256 M – 4,096 - 12 **blocks**

6. Explain how the UNIX file system implements access control lists. (5 pts) What would be the main advantage and the main disadvantage of a fuller implementation of the concept? (2×5 pts)

UNIX implements fixed-size access control lists with read and write and access rights for the owner of the file, the members of the group to which the file belong and all other users. A full implementation of access control lists would allow the file owner to give specific rights to specific users but would be much larger than its current implementation and could not be stored in the file i-node.