COSC 4330 FIRST MIDTERM FEBRUARY 18, 2004

This exam is **closed book**. You can have **one** page of notes. UH expels cheaters

1. Given the following fragment of code:

```
int fd, pd[2];
fd = open("data", O_RDWR | O_CREAT, 0660);
pipe(pd);
```

redirect the standard input of the process to the pipe **"pd"** (2×5 points):

close (0)_____
dup(pd[0])_____

2. Compare user-level and kernel-level threads in terms of;

a) Ease of use: (5 points)

Kernel-supported threads are easier to use because they allow the programmer to use blocking system calls.

b) Applicability to multiprocessor architectures: (5 points)

Kernel-supported threads are better suited to multiprocessor architectures because the kernel scheduler can allocate separate processors to multiple threads in the same address space.

c) Speed: (5 points)

User-level threads are faster because it cost much less to switch between two threads in the same address space.

d) Ease of installation on a system that does not support them: (5 points)

User-level threads are much easier to install on a system that does not support them because installing them does not require any modification to the kernel.

3. How many lines will the following program print out? (5 points)

```
main() {
     fork();printf("Hello!\n");
     fork();
     printf("Goodbye!\n");
}
```

The program will print out exactly __6__ lines.
(that is two "Hello!" and four "Goodbye!")

4. ***Advantages and disadvantages:*** You will get no credit if you mention a disadvantage when an advantage is asked and vice versa. (5 points each)

a) What is the advantage of having a *dual-mode CPU*?

We can prevent users from accessing directly the disk drive.

b) What is the main advantage of *microkernels*?

They allow safe and easy extension of kernel features.

c) What is the main advantage of having all workstations in a lab sharing the same file server rather than having totally separate file systems?

All users can share the same files.

d) What is the main advantage of keeping "zombie" processes in the process table?

It lets the kernel keep track of processes that have already completed but have not been "waited for" by a parent process.

e) What is the main advantage of DMA?

It speeds up data transfers between the main memory and the disk drives.

5. Looking at the number of processes in the ready queue, in the waiting state, and in a suspended state, can you tell whether:

a) The system would benefit from having a faster CPU? (5 points)

If there are many processes in the ready state. _____

b) The system would benefit from having faster drives? (5 points)

If there are many processes in the waiting state. _____

c) The system would benefit from having a larger main memory (5 points)

If there are processes in the ready-suspended state. _____

6. Your first assignment requires you to schedule the CPU of your simulated computer according to a *round-robin policy*, in which "processes that use the CPU for more than **QUANTUM** time units immediately return to the end of the ready queue." What the main advantage of limiting in such way the time a process can remain in the running state? (5 points)

Processes cannot keep the CPU forever when other processes are waiting for it.

7. One hears now of novel storage technologies that would have the same cost and the same access time as current DRAM but will keep its contents when the system crashes. How would these new technologies allow us to access our disk drives in a more efficient fashion? (10 points)

We could make much more extensive use of delayed writes and even keep currently accessed files and directories in non-volatile RAM (NVRAM).

8. We often use the terms **ready state** and **ready queue** in an interchangeable fashion. Could we speak in the same way of a **waiting queue**? (5 points) Explain why. (5 points)

NO, because the waiting state consists of multiple queues.