

NAME: _____ (FIRST NAME FIRST) SCORE: _____

COSC 4330

FIRST MIDTERM

SEPTEMBER 28, 2009

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

1. Questions with short answers. (6×5 points)

- a) What is the major advantage of *microkernels*?

Microkernels allow kernel extensions to run in user space, which prevents them from crashing the kernel. (Also: Microkernels are smaller, more manageable and easier to secure.)

- b) What is the main function of *timer interrupts*?

Timer interrupts prevent processes from monopolizing the CPU for long periods of time.

- c) What is the main disadvantage of *non-preemptive* scheduling policies?

Processes that do not do issue system calls can monopolize the CPU for long periods of time.

- d) What is the main advantage of the *symmetric organization* for multiprocessor operating systems?

All processors can run kernel code, which avoids one potential bottleneck.

- e) What is the main disadvantage of *delaying disk writes*?

Writes may be lost if the process—or the system--crashes.

- f) Give an example of a *hard real-time* application?

Heart pacemakers, and industrial process control systems.

2. What is the *default action* a process takes when it *receives a signal*? (5 points) How can processes specify which other action to take? (5 points) Is it always possible? (5 points)

- a) By default, a process that receives a signal terminates.

- b) A process can specify any other action to be taken when it receives a signal by executing beforehand a `signal()` system call. The signal is then said to be caught by the process

- c) The ninth SIGKIL cannot be caught and always forces receiving processes to terminate.

3. Which are the three required conditions to prevent unauthorized access to user data in a shared computer system? (3×5 points) (*Hint: these requirements can be hardware, software or anything else.*)

- a) The system must have a dual-mode CPU in order to prevent user processes from directly accessing the disk and other peripherals.

- b) The system must have memory protection in order to prevent malevolent users from tampering with the kernel code (and the code of other running processes).

- c) Users must be prevented from rebooting the system with a rogue operating system.

4. Complete the following scheduling table for a System V Release 4 scheduler using the most reasonable values for all parameters: (5 points per correct line)

#ts_quantum	ts_tqexp	ts_slpret	ts_maxwait	ts_lwait	LEVEL
200	<u>0</u>	<u>1</u>	4000	<u>1</u>	# 0
100	<u>0</u>	<u>1</u>	1000	<u>1</u>	# 1

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

```
#include <stdio.h>
main() {
    int pid;
    fork();
    fork();
    if ((pid = fork()) == 0)
        printf ("Hello!\n");
} // main
```

Answer: The program will print four lines.

6. Complete the following code fragment in order to have **stdout** redirected to the pipe **piped**? (2×5 points)

```
int piped[2];

pipe(piped);

close( 1 );

dup( piped[1] );
```

7. Which are the three states from where a process can enter the ready queue? (3×5 points)

- a) From the running state when the process gets interrupted by the scheduler
- b) From the waiting state after the process completes a system call
- c) From the new state after the process arrives