Fall 2015 COMP 3511 Homework Assignment #1

Handout Date: Sept. 11, 2015 Due Date: Sept. 29, 2015

Name: _____ ID: _____
E-Mail: _____ Section: _____

Please read the following instructions carefully before answering the questions:

- You should finish the homework assignment **individually**.
- There are a total of **4** questions.
- When you write your answers, please try to be precise and concise.
- Fill in your name, student ID, email at the top of each page.
- Please fill in your answers in the space provided, or you can type your answers in the *Microsoft Word* file.

- **Homework Collection: the hardcopy** is required and the homework is collected in **collection box #16** (for **L1**) and **#17** (for **L2**). The collection boxes are located outside **Room 4210**, near **Lift 21** (there are labels on the boxes).

1. [20 points] Multiple choices

   1) The two separate modes of operating in a system are
   A) supervisor mode and system mode
   B) kernel mode and privileged mode
   C) physical mode and logical mode
   D) user mode and kernel mode

   2) Which of the following statements concerning open source operating systems is true?
   A) Solaris is open source.
   B) Source code is freely available.
   C) They are always more secure than commercial, closed systems.
   D) All open source operating systems share the same set of goals.

   3) A _____ is an example of a systems program.
   A) command interpreter
   B) Web browser
   C) text formatter
   D) database system

   4) _____ provide(s) an interface to the services provided by an operating system.
   A) Shared memory
   B) System calls
   C) Simulators
   D) Communication

5) Which of the following statements is incorrect?
A) An operating system provides an environment for the execution of programs.
B) An operating system manages system resources.
C) Operating systems provide both command line as well as graphical user interfaces.
D) Operating systems must provide both protection and security.

6) The ____ of a process contains temporary data such as function parameters, return addresses, and local variables.
A) text section
B) data section
C) program counter
D) stack

7) When a child process is created, which of the following is a possibility in terms of the execution or address space of the child process?
A) The child process runs concurrently with the parent.
B) The child process has a new program loaded into it.
C) The child is a duplicate of the parent.
D) All of the above

8) A process that has terminated, but whose parent has not yet called wait(), is known as a _____ process.
A) zombie
B) orphan
C) terminated
D) init

9) Imagine that a host with IP address 150.55.66.77 wishes to download a file from the web server at IP address 202.28.15.123. Select a valid socket pair for a connection between this pair of hosts.
A) 150.55.66.77:80 and 202.28.15.123:80
B) 150.55.66.77:150 and 202.28.15.123:80
C) 150.55.66.77:2000 and 202.28.15.123:80
D) 150.55.66.77:80 and 202.28.15.123:3500

10) Which of the following statements is true?
A) Named pipes do not allow bi-directional communication.
B) Only the parent and child processes can use named pipes for communication.
C) Reading and writing to ordinary pipes on both UNIX and Windows systems can be performed like ordinary file I/O.
D) Named pipes can only be used by communicating processes on the same machine.

2. [30 points] Please answer the following questions in 3-4 sentences

1) (6 points) What are the typical services that cloud computing deliver? What is the main or base technology that a cloud computing platform utilizes to provide such functionality?

2) (6 points) Please compare and contrast a multiprocessor system and a multicore system.

3) (6 points) What are the two main objectives of an operating system? Please briefly elaborate them.

4) (6 points) The best current technology for operating system design involves using loadable kernel modules. Please briefly describe what it is and what the major advantages of this approach are over layered and microkernel approaches

5) (6 points) What is the main difference between an emulation technique and a virtualization technique?

3. [20 points] Simple C programs on fork().

1) (10 points) Consider the following code segments, what is the total number of processes (including the initial process)? Please elaborate.

```
#include <stdlib.h>
#include <stdio.h>
#include <unistd.h>

int main() {
    pid_t pid;
    pid = fork();
    if (pid == 0) {
            if(fork() > 0)
                    fork();
    }
    else
        fork();
    return 0;
}
```

2) (10 points) Consider the following code segments, what is the total number of processes (including the initial process)? Please elaborate

```
#include <stdlib.h>
#include <stdio.h>
#include <unistd.h>

int main() {
    for (i = 0; i < 10; i++)
            if (fork())
                    fork();
            else{
                     fork();
                     fork();
            }
    return 0;
}
```

4. [30 points] Process

1) (6 points) The text section of a process contains the program code; what are the other sections of the memory allocation for a process?

2) (6 points) What is the main difference between a single-thread process and a multi-thread process? Which one can take advantage of a multicore system?

3) (6 points) Please briefly describe at least two differences of the process creation in a Unix system, i.e., fork() and in a Microsoft system, i.e., CreateProcess()

4) (6 points) What are the differences between an orphan process and a zombie process? How does UNIX handle them, respectively?

5) (6 points) Please compare and contrast how multitasking is handled in iOS and Android systems, respectively?