**Assignment 1**

**CIS355** – Spring Term 2018

**Point Value**: 100 points

**Assignment Due Date**: **In class Thursday, Jan 25, 2018**

**Submission Instruction**

Please write your answers to those questions on a Microsoft Word document. The name of the file should be HW1\_YourLastname\_YourFirstnme.docx. Please submit a hard copy of the file to the instructor in class and submit the file on Schoology by 11:59pm.

**Short answers**

1. **What is Operating System (**5 points**) and its main purpose?** (5 points)

An operating system is a control program that manages the execution of user programs. The main purpose of an operating system is to manage CPU time, memory space, file-storage space, and i/o devices.

1. **What is a program** (5 points)**? What is a process** (5 points)**? Please give a creative/funny analogy to distinguish between a process and a program**. (5 points)

A program is a specific set of ordered operations for a computer to perform, while a process is an instance of a program that is being executed.

* Analogy: A person trying to change their tire on a car. You are driving down the road, when suddenly you run over a piece of glass and get a flat tire. However, you do not know how to change a flat tire, so you look up the instructions on how to change a flat tire on Google. The instructions on how to change the tire would be the program and actually doing the steps would be the process.

1. **What is the purpose of system calls (**5 points**)? Please give two examples of system call and describe their purposes.** (5 points)

The purpose of system calls is to provide an interface to the services made available by an operating system. There are 6 types of system calls: process control, file manipulation, device manipulation, information maintenance, communication, and protection. The WriteFile()/write()(File manipulation) system call allows for a user to make changes to a given file. For example, if two employees are creating a soccer practice schedule, one employee will make sure the other employee has write access to the document to make changes to any drills. Another example of a system call would be SetFileSecurity()/chmod(Protection). The purpose of this system call is to make sure unauthorized users do not have access to private files.

1. **What is a monolithic system (**5 points**)? What is a layered system?** (5 points)

Monolithic system requires the entire operation system to be working in kernel space. Monolithic systems have the OS in a single address space providing efficient performance. Also, the structure of the monolithic OS system requires that the interfaces and levels of functionality are not separated. The layered system is each layer built on top of lower layers. The bottom layer is hardware, while the highest layer is the user interface. Each layer uses functions/operations and services of only lower-level layers.

1. **What are the advantages of a layered approach (**6 points**)? What are the disadvantages?** (4 points)

* Advantages: The different layers allow for different abstraction levels and allows good maintenance, where you can make changes without affecting interfaces.
* Disadvantages: It is difficult to assign functions to the correct layer. Also, having too many layers slows down the system.

1. **In OS implementation, what are the advantages of using Assembly language (**5 points**)?** **What are the advantages of high level language such as C++**? (5 points)

* Advantages of Assembly Language: User directly controls the exact instruction sequences that the processor executes. Allowing for extremely fast OS implementation and minimal syntax.
* Advantages of high level language/C++: Same as advantages for assembly language when dealing with application programs (code can be written faster, more compact, easier to understand/debug). Overall, operating systems are easier to port (move to some other hardware) if it is written in a higher-level language.

1. **What are the advantages of using Loadable Kernel Modules?** (10 points)

The functionality can be added to and removed from the kernel while it is running. Therefore, there is no need to recompile or reboot the kernel. The kernel has a set of core components and links in additional services.

1. **What are the design goals of Operating System from a user view (**5 points**)**? **What are the design goals of Operating System from a system view?** (5 points)

User View: Easy to learn and use, reliable/fast/safe

Design Goals: Easy to design, implement, and maintain.

Flexible, reliable, error free, and efficient

1. **What is the difference between 4 processors (each has one core) and 1 processor with 4 cores? (**10 points**)**

Four single core processors perform one operation at a time, it rapidly switches between different tasks. One processor with four cores, by contrast, has four CPU’s on a single chip and executes four separate operations at the same time. Allowing reduced wait times and enhancing the computer’s productivity.

1. **Please describe the procedure of booting a system?** (5 points)
2. The CPU’s instruction register is loaded with a predefined memory location where the initial bootstrap program resides. (The bootstrap program/loader is loaded at power-up)
3. The program is stored in read-only-memory(ROM) a.k.a firmware
4. Test hardware and initializes all aspects of the system
5. Load OS kernel and starts execution

**Hint:** starting with CPU fetch the memory location of a bootstrap program/loader.