CSCE 3613 Operating Systems Homework #1 ver. 5.1

Name: **Robert Johnson**
ID: **010796992**

52 points
19 questions

Instructions

- Type your work, print it to a *single* PDF, and upload it to Blackboard before the due date and time. It is strongly suggested to use the given document.
- Show all of your work. Without proper justification and details of steps, correct answers alone may not carry full credit.
- -2 points if you do not insert your name and ID at the top of the document.
- -5 points if it is not typed.
- -5 points if it is not a PDF file.
- -5 points if it is not a single PDF file. Submit one PDF file. Do NOT submit zip files containing one or more files.
- -5 points if you present the worked problems out of order. In other words, please present the problems in the order assigned, 1, 2, 3, …

1. (6 pts.) What are the three operating system goals?

1. **Execute user programs and make solving user problems easier**
2. **Make the computer system convenient to use**
3. **Use the computer hardware in an efficient manner**

2. (4 pts.) Describe the difference between the user and system view of an operating system.

The user gets the view that makes it easiest for them to use without having to know everything that goes into doing what they are using. The system view is hidden from the user to protect the system from malicious users. They also differ on utilization; the system tries to maximize it while the user view does not care.

3. (1 pt.) In the computer science field, the computer engineering field, and in the operating systems class, how many bytes are there in a Kilobyte? Be specific. Do not round.

There are 1024 bytes in a Kilobyte or 2^10.

4. (1 pt.) According to NIST, what is a *pebibyte*? Be specific. Do not round.

It is a unit of measurement that describes an amount of data capacity. According to NIST it is 2^50 bytes.

5. (1 pt.) The typical computer system organization has shared memory, device controllers, and one or more CPUs connected through a common communication channel called a ____.

A bus.

6. (1 pt.) The disk controller notifies the CPU that it has fetched the data by issuing a(n) ____.

Interrupt

7. (3 pts.) Describe DMA.

DMA stands for Direct Memory Access. This is when a device controller transfers data straight from storage to main memory without going through the CPU like it normally does. This is usually used for high-speed devices that are capable of transmitting information at speeds close to what the memory speed is.

8. (4 pts.) Given that a cache is smaller than the storage being cached, describe the important design problem of cache management.

I would say the important design problem of cache management is that because there is so little space in the cache it is important that you pick the right things to keep in the cache that are going to be called the most. This is basically called the hit rate of the cache. Also, making sure to replace old commands that are not being used.

9. (3 pts.) What are the three advantages of a multiprocessor system?

1. **Increased throughput**
2. **Economy of scale**
3. **Increased reliability – graceful degradation or fault tolerance**

10. (3 pts.) Expand the acronym SMP and describe it.

SMP stands for Symmetric Multiprocessing. This is basically when multiple CPU's all line up symmetrically and they all talk to each other either along a high-speed bus or parallel structure and then talk to main memory.

11. (3 pts.) What is multiprogramming?

Multiprogramming is basically making sure the CPU/OS is always busy, meaning it always is processing job or task. This can be done by scheduling jobs and making sure they are lined up ready to execute. When a job must wait for I/O for example, we make sure we send that job out and get another one in to start working on.

12. (3 pts.) Describe kernel mode.

Kernel mode is a mode that only allows instructions designated as privileged to be executed. When a user process executes and calls a system call, we change the trap mode bit which puts us in kernel mode and allows the system to execute the call and then we switch the bit back and we return back to user mode. This is done so that the OS protects itself from certain processes malicious attacking the system or its components or so that a single process cannot freeze up the system.

13. (3 pts.) What is the difference between a single-threaded process versus a multithreaded process?

A single-threaded process means a process only has one program counter and executes instructions one at a time until completion. Multi-threaded processes, however, has a program counter PER thread so multiple instructions can be executed simultaneously.

14. (3 pts.) What is cache coherency?

Cache coherency is that rule that we need to keep track of variables and values as they are getting moved through different levels of the storage hierarchy. We want to make sure we have the most recent and correct values in our CPU caches.

15. (2 pts.) Define what the host operating system is in a virtual machine environment.

The host operating system in this case will be whatever operating system the CPU is natively running this virtual machine environment on. So, in my case, I am on Windows, and if I were to boot up the VirtualBox software and run the Ubuntu OS in this virtual machine environment, my HOST operating system would be Windows.

16. (3 pts.) Describe a real-time embedded system operating system.

A real-time embedded system is the most prevalent form of computing. These are systems built for performing very specific tasks. These are the system embedded in cars, microwaves, robots, smart fridges, etc. They are designed to do very specific things very quickly within a certain time constraint. They must have fast response times from their inputs and control devices. You do not want to turn a plane, or a car and the system takes a few seconds to compute and make it turn.

17. (2 pts.) In cloud computing, define and describe PaaS.

PaaS stands for Platform as a Service. This is when a consumer can deploy their OWN applications on a platform (cloud infrastructure). The consumer does not control how this platform or infrastructure works but they control how their applications that go onto the platform work. This means the platform is a service. An example would be the Google App Engine or iOS app store which allows consumers to deploy their apps onto these platforms.

18. (3 pts.) Describe the copyleft license used in open source agreements and list the name of a common copyleft license.

Copyleft is the more liberal version of copyright. This license says that first, you have to have your code open source so others can improve on it, but it also means if someone does improve your software and redistributes it, they have to say that it is a derivative of your software. A common copyleft license is the GNU Public License or "GPL". So, if someone takes the GNU software and improves it, they must redistribute under the same GNU Public License.

19. (3 pts.) List the three general methods used to pass parameters to the operating system.

1. **Registers**
2. **A block or table in memory and the address of it.**
3. **Stack**

The End.