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| CSCI 3453 | Homework 1 | Fall 2018 |

1. **List six main services of an operating system? (2 points)**

User Interface, Program Execution, I/O Operations, Communication, Error Detection, Protection and Security

1. **Suppose that a multi-programmed system has a load of N processes with individual total execution times of t1, t2, ... tn. How would it be possible that T > t1 + t2 +...+ tn? In other words, what could cause the total execution time (T) to exceed the sum of the individual process execution time? (1 points)**

Extra overhead is needed to coordinate the processes, increasing the overall amount of execution time.

1. **What is the purpose of interrupts? What are the differences between a trap and an interrupt? (2 points)**

Interrupts are used to signal the OS that a process is request processing time. The difference between traps and interrupts is that traps are generated by hardware and interrupts are generated by software.

1. **Describe some of the challenges of designing operating systems for small sensor devices compared with designing operating systems for traditional PCs (1 points).**

When designing operating systems for small sensor devices, the designers must design the system to handle a limited amount of memory and battery levels, as well as considering the efficiency of the design choices. For traditional operating systems, these things are not as concerning with modern memory being large and power being readily available.

1. **What is the main advantage of the microkernel approach to system design? What are the disadvantages of using the microkernel approach (2 points)**

The main advantage of a microkernel system design is that microkernels are very small – only the services that are needed are included in the user mode of the kernel. However, the disadvantage of this is increase communication time between services as the must communicate through the kernel.

1. **What is the main advantage for the layered approach to system design? What are the disadvantages of layered approach? (2 points)**

The main advantage of a layered system design is the abstraction of the layers – each layer is a smaller problem that must be solved. This means that each layer is independent, making debugging much easier as each layer can assume that the layer below is correct, narrowing the issue to the current layer being debugged. The disadvantage to layered system design is redundancy. Because the layers are independent, functionality may be duplicated between layers.