Score:____________Name:____

ECE 3055 Quiz 1

1. (*5 points*) A thread is just a sequence of machine instructions to execute. On a PC, multiple threads can be executed in parallel on multiple processors (i.e., cores). The OS can only schedule threads on different processors that are explicitly setup as threads in the programmer's code; it cannot automatically split a program into threads. A single threaded application program currently runs on one processor. 25% of its execution time is purely sequential code that can only run on one thread or processor. 75% of the application code could be executed in parallel on several processors, if the application was rewritten to include multiple threads for this portion of the code. A new multicore processor is available with 8 processor cores. Compute the maximum possible speedup that could be obtained in the application on a multicore processor, assuming it was rewritten by the programmer to use 2, 4, and 8 threads. Assume it is possible to evenly balance the processor time when using multiple threads that are running one thread per core, and that there is no overhead to synchronize the cores.

   1/((.75/n)+.25)

   With two threads the application could run up to ____*1.6*________ times faster on two cores.

   With four threads the application could run up to ____*2.28*________ times faster on four cores.

   With eight threads the application could run up to____*2.91*________ times faster on eight cores.

2. (*4 points*) An AMD 3 GHz X86 (CISC) processor runs the SPEC2006 Benchmark Programs shown in the table below. Fill in the missing table entries.

Benchmark	*Instructions x 10^9*	*Execution time (sec)*	*Average CPI*
mcf	336	1150	*10.26*
perl	2118	*499*	.707

3. (*1 point*) Why did high performance single chip processors switch in recent years to multiple cores instead of a faster and more complex single processor?

   More complex processors were using a lot more hardware and more power with an ever diminishing increase in performance. So the thinking was that several less complex processors on a single chip would yield better performance.