CSCI/CMPE 2333 Fall 2016 Homework #1

Due date: Friday, 9/15/2016

Please use a word processor (easier to read). A hard copy must be turned in at the beginning of class on Friday. Note that work must be shown for all computations or no credit will be received, even if the correct answer is given.

Chapter 1:

1. What are the four main functions of a computer? Give an example of each. [10 pts]
2. List **and briefly define** the main structural components of a computer. [10 pts]
3. List **and briefly define** the main structural components of a processor. [10 pts]

Chapter 2:

1. Explain Moore's Law as it was originally stated in 1965. Also, explain how closely it has been followed in the recent decades. [5 pts]

2. A benchmark program is run on a 2GHz processor (1GHz = 10^9 cycles/sec). The executed program consists of 1,000,000 instruction executions, with the following instruction mix and clock cycle count:

Instruction Type	**Instruction Count**	**Cycles per Instruction**
Integer arithmetic	420,000	1
Data transfer	330,000	2
Floating point	150,000	4
Control transfer	100,000	3

   Determine the effective (average) CPI, MIPS rate, and execution time for this program. [15 pts]

3. You are designing a new processor and are told that you can make exactly one of the following improvements for the costs listed. Which improvement gives a better ratio of cost to overall speedup? Give the overall speedup for each, as well as the ratio.
   a. Implement a new floating point adder for $40,000. The new floating point adder would be twice as fast as the old, and floating point addition accounts for 18% of all instructions. [10 pts]
   b. Increase the speed of load instructions by 15%. Load instructions account for 30% of all instructions and this improvement would cost $20,000. [10 pts]