**CIS 21JA Assignment 2 Name: Jason Hammar**

*Questions 1 - 7 are 1 pt each*

1. Name the 4 parts of a CPU, and next to each part name, write one sentence *in your own words* to describe its main purpose. (I'm familiar with the descriptions in the class notes, so a copy-paste won't get credit)

The 4 parts of the CPU are:

1. Clock: A part of the CPU that is constantly ticking and running constantly and will generally move between a high and low type of voltage

2. Control unit: This part of the CPU will help the computer with its execution of code and any execution steps that need to be coordinated.

3. Arithmetic and logic unit (ALU): Does math or arithmetic type operations and calculates it for the user with integers and bitwise type operations.

4. Registers: The registers will keep data within themselves for a little bit while the CPU is performing important operations.

2. With a 5-stage *pipelined* processor, where each stage takes 1 clock cycle, how many clock cycles does it take to execute 15 instructions?  
Answer: 20

With a 5-stage *non-pipelined* processor, with each stage also taking 1 clock cycle, how many clock cycles does it take to execute the same 15 instructions?  
Answer: 34

3. If you need to temporarily store a calculation result in your code, would you use a register or a memory variable? Why?

Answer: Memory Variable because the register is used to store data during an operation, while the memory variable is used to store the result of that operation.  
  
4. Our assembly programs uses 32 bits to address memory and can access up to 4 GB of memory. If you write assembly code for a system that uses 16 bits to address memory, what size memory can your program access?

Answer: 2 GB

5. If you convert an assembly program that is written for a RISC processor into a program that runs on a CISC processor, would the new program likely be longer or shorter? Why?

Answer: It would be shorter because the programs that run on a CISC processor tend to be complex and can do multiple things for 1 instruction, as a result, they end up being shorter.

6. How can a program that accesses up to 4GB of memory run on a system that only has 1GB of RAM (physical memory)?

Answer: The program uses paging to permit the total memory to be larger than the physical memory, so that way we won't need 4 GB of RAM on our computer to run the program.

7. Since conventional memory is slower than the CPU, what does the computer have to help make memory access faster? Your answer should not include registers, they don't help memory access speed.

Answer: The program uses registers, caches, pipelining and multicore processing as well, in order to make the memory access speed up a bit.

8. (8pts) Download the file Assignment2.asm and bring it into the IDE Project. Then follow the steps in the file to observe and record the data values as you step through the code. Copy your observed results here.

mov ax, 120h ; AX = A300

add ah, 0a2h ; AH = A3

inc al ; AL = 00

and eax, -50 ; EAX = FFFFA300

bigData in memory = 20 65 6e 63 6f 64 69 6e