**CIS 21JA Assignment 2 Name: aryan garg**

*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 Clock: This is a “Pulse” that helps syncronize the cpu as well as other parts of a computer*

*the Control unit: controls the fetch-decode-execute cycle*

*ALU – the part of the cpu that actually does the calculations / arithmetic*

*Registers – Stores data temporarily in the CPU*

2. With a 5-stage *pipelined* processor, where each stage takes 2 clock cycles, how many clock cycles does it take to execute 10 instructions?

2\*(5 + (10-1)) = 28 cycles

With a 5-stage *non-pipelined* processor, with each stage also taking 2 clock cycles, how many clock cycles does it take to execute the same 10 instructions?

5\*2\*10 = 100 cycles

3. With respect to the instruction execution cycle, what is the advantage of storing data in registers instead of in memory variables? Make sure your answer refers to the instruction execution cycle to show the advantage

Accessing memory / RAM is very slow, taking up multiple clock cycles just to read / write. Accessing / storing data in registers is very fast, and instructions directly access these registers for data

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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?

2^16 = 65536 bits = 0.00006 GB

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

The new program would be longer. CISC has more complicated and concise instructions, so translating it to RISC will require you to use more instructions to describe your program, so the program will be longer

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

*Yes, because operating systems use virtual memory / paging, so the rest of the 3GB of memory can be stored on the disk and retrieved when needed*

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.

The computer can keep a cache of the memory, so that if there is a hit the CPU can take the data directly from the cache instead of going all the way to the memory

8. (8pts) Download the file Assignment2.asm and bring it into the IDE Project. Then follow the steps in the file and fill in the data values you observe in the source file (the asm file). Then copy the data here to turn in your results.

mov ah, 101b ; AX = 05FE

sub ah, -2 ; AH = 07

inc al ; AL = FF

xor eax, 0FFFFH ; EAX = FFFFF800

bigData in memory = EF CD AB 90 78 56 34 12