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| Instructor | ***Luke Papademas*** | Due Date | **6/23** |

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| Part | **1** | **2** | **3** | **4** | Total |
| *Maximum Points* | **25** points | **25** points | **25** points | **25** points | **100**G101010 pointsG |
| ***Your Score*** |  |  |  |  |  |

**Textbook Reading Assignment**

Thoroughly read Chapter(s) 4 in your Computer Architecture and Organization textbook.

**Part 1 Glossary Terms - Computer Hardware Specifications**

Define, in detail, each of these glossary terms from the realm of computer architecture and computer topics, in general. If applicable, use examples to support your definitions. Consult your notes

or course textbook(s) as references or the Internet by visiting Web sites such as:

[**http://www.ask.com**](http://www.ask.com) or [**http://www.webopedia.com**](http://www.webopedia.com/)

**(a) ALU ( Arithmetic Logic Unit )**

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| The arithmetic logic unit carries out the logic operations and arithmetic operations required during program execution. The ALU knows which operations to perform because it is controlled by signals from the control unit. |

**(b) Assemblers**

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| Assemblers convert assembly language into machine language. Assemblers read a source file and produce an object file. They build a set of correspondences call a symbol table. This is used to allow the assembler to pass over the assembly language instructions and understand the instructions. |

**(c) Buses**

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| Buses are a set of wires that act as a shared datapath to connect multiple subsystems within the system. At any one time, only one device can use the bus. Devices that use the bus are usually divided into a master and slave. Buses can be point to point, meaning they connect two specific components, or multipoint, meaning they connect a number of devices. |

**(d) Clocks**

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| Clocks regulate how quickly instructions can be executed. They synchronize all of the components in the system. There are a couple of attributes that indicate clock performance:   * Clock cycles – time between clock ticks * Clock frequency – measured in MHz or GHz * Clock cycle time – reciprocal of the clock frequency |

**(e) Control Unit**

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| The control unit monitors execution of all instructions and the transfer of information. It extracts instructions from memory, tells the ALU which registers to use, services interrupts, and turns on the correct circuitry. It uses a program counter to find the next instruction for execution and a status register to keep track of overflows, carries, and borrows. |

**Part 2 Exercises - Computer Hardware Specifications**

For each of the following, select the correct answer.

**(1)** Suppose the RAM for a certain computer has 256M words, where each word is 16 bits long. What is the capacity of this memory expressed in bytes?

(a) 2 30 (b) 2 29 (c) 2 20 (d) 2 27 (e) 2 10

**(2)** A flip - flop circuit is also known as a(n) \_\_\_\_\_\_\_\_\_\_ .

(a) Eccles - Jordan switch (b) unlatching relay

(c) mercury switch (d) uni - polar switch

**(3)** Modern computer clock speeds are measured in \_\_\_\_\_\_\_\_\_\_ .

(a) gigabytes (b) millions of pulses per second

(c) millions of pulses per minute (d) billions of pulses per second

**(4)** Assemblers and compilers usually translate a source program into machine instructions contained in what type of file?

(a) include file (b) binary file

(c) object module (d) hidden file

**(5)** A register is a(n) \_\_\_\_\_\_\_\_\_\_ .

(a) a part of the processor that performs an operation

(b) a part of the processor that keeps a log of operations

(c) the part of the operating system that oversees what programs are selected for execution

(d) a part of the processor that holds a bit pattern

**Part 3 Exercises - Computer Hardware Specifications**

Mix and Match

Match the definition on the left with the most appropriate definition on the right.

**(1)** \_F\_\_\_\_ fetch, decode (a) assists in improving interoperability

**(2)** \_D\_\_\_\_ computer architecture (b) the physical aspects of a computer system

**(3)** \_I\_\_\_\_ PCI (c) the brain of the computer

**(4)** \_J\_\_\_\_ RAM (d) the logical aspects of a computer system

**(5)** \_H\_\_\_\_ bus (e) commands the CPU is designed to understand

**(6)** \_G\_\_\_\_ clock speed (f) tasks performed by the control unit in the CPU

**(7)** \_C\_\_\_\_ CPU (g) measured in cycles per second

**(8)** \_B\_\_\_\_ computer organization (h) allows the flow of data and program instructions

**(9)** \_E\_\_\_\_ instruction set (i) slots near the CPU to connect other devices

**(10)** \_A\_\_\_\_ hardware standards (j) an important consideration when buying a computer

**Part 4 Exercises - Computer Hardware Specifications**

Write a complete answer for each of these.

**(1)** What are the main functions of the CPU?

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| **The main functions of the CPU are fetching program instructions, decoding each instruction that is fetched, and performing the indicated sequence of operations on the correct data.** |

**(2)** How is the ALU related to the CPU ? What are its main functions?

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| **The ALU is a component within the CPU. Its main functions are carrying out the logic operations, such as comparisons, addition, and multiplication during the program execution. It usually has two data inputs and one data output.** |

**(3)** Explain what the CPU should do when an interrupt occurs. Include in your answer the method the CPU uses to detect an interrupt, how it is handled, and what happens when the interrupt has been serviced.

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| **The interrupt process is as follows. First, the CPU detects an interrupt signal. It then saves the program’s state and variable information. The interrupt request number or device ID is used to find the interrupt service routine. The address of the service routine is retrieved and placed into the program counter. Execution resumes with the service routine. After the interrupt service has completed, the system restores the program’s state and variable information and resumes program execution.** |

**(4)** A digital computer has a memory unit with 24 bits per word. The instruction set consists of 150 different operations. All instructions have an operation code part ( opcode ) and an address part ( allowing for only one address ) . Each instruction is stored in one word of memory.

(a) How many bits are needed for the opcode?

(b) How many bits are left for the address part of the instruction?

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| **There are 8 bits needed for the opcode which means 16 bits are left over for the address part of the instruction.** |