

Student name: Zixu Jiang

HOMEWORK 1 The due date to submit is on Sunday, September 16, 2018

The purpose of this assignment is a basic overview of the textbook's materials, so you will understand the context of the entire course from the start date.

Please use the MLA style. Please review the following link:

<https://owl.english.purdue.edu/owl/resource/747/13/>

	Answer:	Work Cited
1. Why the Von Neumann model is essential in understanding computers? (Chapter 1)	Von Neumann's machine contained every major feature considered essential to modern computer architecture. Modern computer architecture is still referred to as Von Neumann architecture.	The - Irv Englander <i>The Architecture of Computer Hardware and System Software A , 5th Edition</i> , Page 27.
2. Numbers: Please write TWO examples representing the numerical data in any possible base, including binary, hexadecimal and octal, as well as floating point number notations	1. 20 (10 base) Binary: 1 0100 Hexadecimal: 0X14 Octal: 24 2. Floating point number: 20.55 (10 base) Binary: 1 0100.10 Hexadecimal: 14.8c Octal: 24.43	The - Irv Englander <i>The Architecture of Computer Hardware and System Software A , 5th Edition</i> , Page 87 166
3. Data - Please describe any TWO examples representing different formats of data used for still images (bitmap versus object images), video, audio and alphanumerical data. (Ch 4 p. 100-135)	Images (bitmap): 1. GIF (graphical image format) 2. TIFF (tagged image file format) Video: 1. QuickTime 2. MPEG – 2 or -4 Audio: 1. MP3 2. WMA Alphanumerical data: 1. Unicode 2. ASCII	The - Irv Englander <i>The Architecture of Computer Hardware and System Software A , 5th Edition</i> , Page 103
4. LMC - Explain the inner workings of the Little Man Computer and its relation with real life computers, including the basics of assembly instructions. (A three-four sentences	The Little Man Computer model consists of a Little Man in a mailroom with mailboxes, a calculator, and a counter. Input and output baskets provide communication to the outside world. Both the Little Man Computer and real computer are von Neumann computer architecture. Both of them work by following simple instructions and the exact steps reflect closely in a real CPU	The - Irv Englander <i>The Architecture of Computer Hardware and System Software A , 5th Edition</i> , Page 190 - 191

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answer will suffice) Ch 6—p.178-193	in executing an instruction.	
5. CPU-memory – Explain how the CPU and memory communicate. Concept of a register (including MAR/MDR). (A three-four sentences answer will suffice) Ch 7 p. 201	1) There are two registers, the memory address register and the memory data register act as an interface between the CPU and memory. Then, CPU and memory communicate by MAR/MDR. 2) A register is a single, permanent storage location within the CPU used for a particular, defined purpose. The memory data register (MDR), sometimes known as the memory buffer register, will hold a data value that is being stored to or retrieved from the memory location currently addressed by the memory address register. The memory address register (MAR) holds the address of a memory location.	The - Irv Englander <i>The Architecture of Computer Hardware and System Software A , 5th Edition</i> , Page 201
6. Fetch-execute – What is the fetch-execution ? (Ch 7.4 p. 207)	The fetch-execute is the basic operational process of a computer system. The first step in the instruction cycle always requires that the instruction must be fetched from memory. (step 1) PC -> MAR. The next step is to transfer that instruction to the instruction register: (step 2) MDR -> IR. The next thing that the Little Man did was to read the address party of the load instruction. He then walked over to the mail box specified by that address, read the data, and copied it into the calculator. The real CPU will operate similarly, substituting register transfers for the Little Man. Thus, (step 3) IR[address] -> MAR. Next step prepares the memory module to read the actual data that will be copied into the “calculator”, which in this case will be the accumulator. (step 4) MDR -> A. Next step the CPU increments the program counter, and the cycle is	The - Irv Englander <i>The Architecture of Computer Hardware and System Software A , 5th Edition</i> , Page 207

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	complete and ready to begin the next instruction. (step 5) PC + 1 -> PC	
7. Stack - How the stack is permanently used through any subroutine call to better write code? (Ch 7.13 p. 221)	if the routine is called a second time, from within itself, the original returning address is lost and replaced by the new return address. The program is stuck in an infinite loop. Besides, the return address is stored on a stack. This time when the routine is again called, the original address is simply pushed down the stack, below the most recent address. Then the program "winds its way back out" in the reverse order from which the routines were entered. This is exactly what people want: people always return from the last called subroutine to the one just previous.	The - Irv Englander <i>The Architecture of Computer Hardware and System Software A , 5th Edition</i> , Page 221
8. I/O – Please list different types of Input/Output: Programmed I/O vs Interrupts and explain how they each work, as well as their advantages and disadvantages. (Ch 9.3)	<p>1) Programmed I/O: Programmed I/O is a method of transferring data between the CPU and a peripheral, such as a network adapter or an ATA storage device. Advantage:</p> <ol style="list-style-type: none">1. A program and processor dedicated to wait and repeatedly tests the status and for I/O data transfer till the I/O operation completes. <p>Disadvantage:</p> <ol style="list-style-type: none">1. A program has to wait and repeatedly tests the status; Waiting period for an asynchronous event can be too large.2. Many I/O devices generate asynchronous events – events that occur at times that the processor cannot predict or control, but which the processor must respond to quickly to provide acceptable performance. <p>2) Interrupts: An interrupt message sent to the computer on these interrupt lines will cause the computer to suspend the</p>	<p>The - Irv Englander <i>The Architecture of Computer Hardware and System Software A , 5th Edition</i>, Page 273 - 286 http://www.dauniv.ac.in accessed 14 September 2018</p>

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	<p>program being executed and jump to a special interrupt processing program. Interrupt messages are triggered primarily by the various I/O controllers in the system.</p> <p>Advantage:</p> <ol style="list-style-type: none">1. The interrupt as an external event notifier.2. The interrupt as a completion signal.3. The interrupt as a means of allocating CPU time.4. The interrupt as an abnormal event indicator. <p>Disadvantage:</p> <ol style="list-style-type: none">1. Sometimes interrupts can be terminated or selectively disabled by program instructions. This is because the CPU has to transfer the data word by word between I/O module and memory.	
<p>9. DMA - How Direct Memory Access works and when it is useful to use it? (Ch 9 p 268)</p>	<p>1) Computer systems provide a more efficient form of I/O that transfers block data directly between the I/O controller and computer memory, under control of the I/O controller. The transfer is initiated by a program in the CPU, using programmed I/O, but the CPU can then be bypassed for the remainder of the transfer. The I/O controller will notify the CPU with an interrupt when the transfer is complete. Once this has occurred, the data is in memory, ready for the program to use. This technique of I/O-memory data transfer is known as direct memory access, or more commonly, simply as DMA.</p> <p>2) DMA is particularly well suited for high-speed disk transfers. Since the CPU is not actively involved during the transfer, the CPU can be used to perform other tasks during the time when I/O transfer are taking place. This is particularly useful for large systems</p>	<p>The - Irv Englander <i>The Architecture of Computer Hardware and System Software A , 5th Edition</i>, Page 286</p>

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	such as Web serves. Furthermore, DMA can be used with other high-speed devices. And the transfers may be made in either direction. DMA is an effective means to transfer video from memory to the video I/O system for rapid display.	
<p>10. Buses – Please list the advantages and limitations of different types of buses (serial vs parallel with many examples). Ch 7.5 page 210</p> <p>11. Peripherals - How computer peripherals work, including magnetic disk drives (floppy disks, hard drives), optical disk drives (CD-R, CD-RW, DVDROM, DVD+R, DVD-R, DVD+RW, DVD-RW), displays (CRT and LCD monitors) and laser printers and realize why it is important to limit the number of disk-read phases when writing programs. (Ch 10 p. 297)</p>	<p>Buses:</p> <p>1) For serial bus Advantage:</p> <ol style="list-style-type: none">1. The serial bus is easy to use.2. It has robust connector system.3. It has low cost.4. It has variety of connector types and size available.5. It has true plug and play nature.6. It has low power consumption.7. Fits almost all devices that have a USB port. <p>Limitations:</p> <ol style="list-style-type: none">1. It has limited capability and overall performance.2. Universal Serial Bus does not provide the broadcasting feature, only individual messages can be communicated between host and peripheral.3. The data transfer not as fast as some other systems. <p>2) For parallel bus Advantage:</p> <ol style="list-style-type: none">1. High-throughput capability.2. Widely used in transporting data to CPU. <p>Limitations:</p> <ol style="list-style-type: none">1. It supports short distance communication between devices. This is due to crosstalk between the parallel lines.2. It uses more wires compare to serial interface and hence it is costly and a bit complex to implement	<p>The - Irv Englander <i>The Architecture of Computer Hardware and System Software A , 5th Edition</i>, Page 210 www.polytechnichub.com accessed 14 September 2018</p>

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	<p>Peripherals:</p> <p>1) Magnetic disk drives: In our computer's hard drive, there aren't really any iron nails. There's just a large shiny, circular "plate" of magnetic material called a platter, divided into billions of tiny areas. Each one of those areas can be independently magnetized or demagnetized. Magnetism is used in computer storage because it goes on storing information even when the power is switched off.</p> <p>2) Optical disk drives: An optical disk drive uses a laser to read and write data. An optical drive that can work with multiple types of discs will therefore contain multiple lasers. The mechanism to read and write data consists of a laser, a lens to guide the laser beam, and photodiodes to detect the light reflection from the disc.</p> <p>3) Display In order to display a pixel on the screen, the system transforms the pixel color to a screen color by reading the RGB values that correspond to the particular pixel value from the table. Then the RGB colors are delivered to the screen.</p> <p>4) Laser prints Laser printing is derived from xerography. The image is produced electronically with a bright light, as in a copy machine.</p> <p>5) This is because too many disk-read phase will limit the execution speed.</p>	