Student name:_Akshatha Vasant Hegde_____

HOMEWORK 1 The due date to submit is on Sunday, January 30
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.
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		Answer:		Work Cited
1.	Why **the Von Neumann model** is essential in understanding computers ? (Chapter 1)	The Von Neumann model contains every major feature considered essential by modern achitechture. The Von Neumann model contains input, output, ALU, control unit, and main memory, which establishes this model as the standard.		Englander, I. (2014). 1. Computers and Systems. In *The architecture of computer hardware and systems software: An information technology approach* (5th ed., pp. 13–16). essay, Wiley.
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	Two examples of numerical data in any base : EXAMPLE 1 Number – 12 Decimal : 12 Binary : 1100 Octal : 14 Hexadecimal : 12 EXAMPLE 2 Number – 7580 Decimal : 7580 Binary : 1 110 110 011 100 Octal : 16634 Hexadecimal : 1D9C		Englander, I. (2014). Chapter 3 Number Systems. In *The architecture of computer hardware and systems software: An information technology approach* (Fifth, pp. 73–78). essay, Wiley.
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)	STILL IMAGES: Bit Map: 1. GIF : GIF was first developed by CompuServe in 1987 as a proprietary format that would allow users of the online service to store and exchange bitmap images on a variety of different computing platforms. The GIF format is used extensively on the Web. GIF assumes the existence of a rectangular "screen" upon which is located one or more rectangular images of possibly different sizes. Areas not covered with images are painted with a background color. The pixel data is compressed, using an algorithm called LZW. LZW is called a		Englander, I. (2014). Chapter 4 Data Formats. In *The architecture of computer hardware and systems software: An information technology approach* (Fifth, pp. 104–124). essay, Wiley. Alex, & Bhavya. (2017, January 15). *The PICT Image File Format.* Prepressure. Retrieved January 28, 2022, from https://www.prepressure.com/library/file-formats/pict *What is an MOV video -*

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	lossless compression algorithm because it is reversible: the original data is restored exactly upon expansion. 2. PNG : Portable Network Graphics) format is the best-known losslessly compressed alternative to GIF. PNG can store up to 48 bits of color per pixel, and additionally can store a transparency percentage value and a correction factor for the color in a monitor or printer. Its compression algorithm is often more efficient than that used with GIF. Unlike GIF, PNG stores only a single image in a file. Object Images: 1. Postscript page description language : Postscript is a format that can be used to store, transmit, display, and print object images. A page description is a list of procedures and statements that describe each of the objects on a page. PostScript embeds page descriptions within a programming language. The programming language is stored in ASCII or Unicode text form. Thus, PostScript files can be stored and transmitted as any other text file. An interpreter program in the computer or output device reads the PostScript language statements and uses them to create pages that can then be printed or displayed. 2. PICT : PICT is a file format that was developed by Apple Computer in 1984 as the native format for Macintosh graphics. PICT files are encoded in QuickDraw commands. The PICT file format is a meta-format that can be used for both bitmap	*adobe.com*. (n.d.). Retrieved January 29, 2022, from https://www.adobe.com/ creativecloud/video/hub/ guides/what-is-an-mov-video Chishti, M. A. (2021, July 26). *Mp4 file format*. MP4 File Format. Retrieved January 29, 2022, from https://docs.fileformat.c om/video/mp4/

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	images and vector images. PICT files are primarily used to exchange graphics between various Macintosh applications. VIDEO : 1. MOV : MOV is a video format that was developed by Apple. It's an MPEG 4 video container file that is primarily used with Apple's QuickTime program. An MOV video can hold many different video formats and multimedia — audio, video, and text — in the same file on different tracks. 2. MP4 : MP4(short for MPEG-4 Part 14) is a file format based on QuickTime File Format but formally specifies support for Initial Object Descriptors (IOD) and other MPEG features. It is mostly used to store video and audio but can also be used to store subtitles and still images. MP4 is an international audio-visual coding standard. Similar to most modern container formats, MP4 supports streaming over the internet. Due to the high compression used in MP4, the resultant files are smaller in size with almost all the original quality retained. AUDIO : 1. .WAV : The .WAV format was designed by Microsoft as part of its multimedia specification. The format supports 8- or 16-bit sound samples, sampled at 11.025 kHz, 22.05 kHz, or 44.1 kHz in mono or stereo. The .WAV format is very simple and does not provide support for a lot of features, such as the looping of	

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	sound blocks .WAV data is not compressed. The format consists of a general header that identifies a "chunk" of data and specifies the length of a data block within the chunk. The header is followed by the data block. The general header is used for a number of different multimedia data types. 2. MP3 : MP3 is the predominant digital audio data format for the storage and transmission of music. It is characterized by reasonable audio quality and small file size. MP3 uses a number of different tactics and options to achieve its small file sizes. These include options for different audio sampling rates, fixed or variable bit rates, and a wide range of bit rates that represent different levels of compression. The bit rate, measured in kbits/second is directly related to the size of the file, however lower bit rates result in lower audio quality. ALPHANUMERICAL DATA : 1. ASCII : The ASCII code was originally developed as a standard by the American National Standards Institute (ANSI). ANSI also has defined 8-bit extensions to the original ASCII codes that provide various symbols, line shapes, and accented foreign Together, the 8-bit code is known as Latin-1. Latin-1 is an ISO (International Standards Organization) standard. 2. UNICODE : Unicode divides its character encodings into sixteen 16-bit code pages, called planes. There is a base plane plus fifteen supplementary planes, which	

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	allows space for about a million characters. Unicode defines three encoding methods, UTF-8, UTF-16, and UTF-32. UTF-8 and UTF-16 use a variable number of bytes to encode characters. UTF-32 encodes all characters using a 32-bit word for each.		
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 answer will suffice) Ch 6—p.178-193	The Little Man Computer model consists of a Little Man in a mailroom with mailboxes, a calculator, a counter and input and output baskets to provide communication to the outside world. The Little Man performs work by following simple instructions described by three-digit numbers. The first digit specifies an operation and the last two digits most commonly point to an address. The instructions provide operations that can move data between the mail slots and the calculator, move data between the calculator and the input and output baskets, perform addition and subtraction, and allow the Little Man to stop working. There are also instructions that cause the Little Man to change the order in which instructions are executed, either unconditionally or based on the value in the calculator. Both data and instructions are stored in individual mail slots. The Little Man executes instructions sequentially from the mail slots unless there is a branching instruction. In that case, he notes the value in the calculator, if required, and resumes executing instructions from the appropriate location. The exact steps performed by the Little Man are important because they reflect closely the steps performed in a real CPU in executing an instruction.		Englander, I. (2014). Chapter 6 the little man method. In *The architecture of computer hardware and systems software: An information technology approach* (Fifth, pp. 190–191). essay, Wiley.

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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	The Memory Data Register (MDR) is connected to every cell in the Memory Data Register (MDR). Each bit of the MDR is connected in a column to every location in the memory. The Addressing Decoder makes sure that only one row of cells is activated at a time. Thus MDR has access to the values in a single row.	Englander, I. (2014). Chapter 7 The CPU and Memory. In *The architecture of computer hardware and systems software: An information technology approach* (Fifth, pp. 200–201). essay, Wiley.
6.	**Fetch-execute** – What is the fetch- execution ? (Ch 7.4 p. 207)	The fetch-execution instruction cycle is the basis for every capability of the computer. Most of the procedure consists of copying data from one register to the other. Every instruction must be fetched from the memory before execution.	Englander, I. (2014). Chapter 7 The CPU and Memory. In *The architecture of computer hardware and systems software: An information technology approach* (Fifth, pp. 207–208). essay, Wiley.
7.	**Stack** - How the stack is permanently used through any subroutine call to better write code? (Ch 7.13 p. 221)	Stacks are used for storing the return addresses and arguments from subroutine calls. Program routines that are recursive must "call themselves". If the routine is called from within itself when there is no stack, it may result in an infinite loop as the original returning address is lost. Using a stack, the original returning address will be pushed down the stack and will later wind its way back out.	Englander, I. (2014). Chapter 5 The CPU and Memory. In *The architecture of computer hardware and systems software: An information technology approach* (Fifth, pp. 220–222). essay, Wiley.
8.	**I/O** – Please list different types of Input/Output: Programmed I/O vs Interrupts and	Types of input/output devices – Programmed I/O, Interrupts. PROGRAMMED I/O : In the simplest method for performing I/O, an I/O controller is connected to a pair of I/O registers in the CPU via a bus.	Englander, I. (2014). Chapter 9 Intput/Output. In *The architecture of computer hardware and systems software: An information technology*

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| explain how they each work, as well as their advantages and disadvantages. (Ch 9.3) | Input from the peripheral device is transferred from the I/O controller or buffer for that peripheral device to the I/O data register and from there to an accumulator or general-purpose register under program control. Individual words of output data pass from a register to the I/O data register where they can be read by the appropriate I/O controller, again under program control. Each instruction produces a single input or output. This method is known as programmed I/O. ADVANTAGES AND DISADVANTAGES : Programmed I/O is obviously slow, since a full instruction fetch–execute cycle must be performed for each and every I/O data word to be transferred. With programmed I/O, input from the keyboard is accepted only under program control. There is one important application for programmed I/O: alternative methods of I/O use the I/O controller to control certain types of I/O operations independently from the CPU, using memory as the intermediate site for the data transfer.

INTERRUPTS: Computers provide interrupt capability by providing one or more special control lines to the central processor known as interrupt lines. The messages sent to the computer on these lines are known as interrupts. The presence of a message on an interrupt line will cause the computer to suspend the 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. ADVANTAGES AND DISADVANTAGES : The interrupt is a simple but effective method for allowing the operating system to share CPU resources among several | *approach* (Fifth, pp. 273–276). essay, Wiley.

Interrupt driven I/O. I/O Techniques. (n.d.). Retrieved January 29, 2022, from http://inputoutput5822.weebly.com/interrupt-driven-io.html |

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	programs at once. It is fast and efficient. Unfortunately it is difficult to write in low level languages and it is difficult to get various pieces to work together.		
9. **DMA** - How Direct Memory Access works and when it is useful to use it? (Ch 9 p 268)	The DMA provides the ability to utilize the CPU more fully while I/O operations are taking place. Executing separate instructions for each piece of data from a block would be impractical for data from disks, tapes, and flash memory. Most processing takes place in blocks, making transferring of data blocks directly from I/O controller and memory morst ideal. In such cases DMA is useful to use. The transfer of data blocks is initiated by the CPU using programmed I/O, and then the CPU is bypassed for the remainderer of the transfer. Under the control of I/O controller, the block of data is tranfered between. The I/O controller will notify the CPU with an interrupt when the transfer is complete.		Englander, I. (2014). Chapter 9 Input/Output. In *The architecture of computer hardware and systems software: An information technology approach* (Fifth, pp. 286–287). essay, Wiley.
10. **Buses** – Please list the advantages and limitations of different types of buses (serial vs parallel with many examples). Ch 7.5 page 210	A bus is a group of electrical or optical conductors suitable for carrying computer signals from one location to another. Buses are characterized as serial or parallel. Parallel bus is a bus where there is an individual line for each bit of data, address and control being used. This means that all bits can be transferred simultaneously. A serial bus is a bus that transfers every bit sequentially, through a single data line. PARALLEL BUS ADVANTAGES AND DISADVANTAGES: Because all bits of data are transferred virtually at once, parallel bus is characterized by high troughput. Because of this most buses internal to the CPU are parallel buses. Unfortunatly parallel buses are expensive and consume a lot of space. Parallel buses have radio-generated		Englander, I. (2014). Chapter 7 The CPU and Memory. In *The architecture of computer hardware and systems software: An information technology approach* (Fifth, pp. 210–214). essay, Wiley.

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	electrical interference between the lines of at high data transfer rates. As data rate increases, so does the interference which limits the speed of the bus. There is a slight timedelay in the data transfer on different lines known as skew. The transfer rate is limited by the skew. The cost of Fiber optic technology makes parallel buses impractical. SERIAL BUS ADVANTAGES AND DISADVANTAGES : Data on serial buses are tranfered sequentially on a single line. The limitations of parallel buses make the uses of serial buses very attractive even in the case of high data transfer rate requirements. Using fiber optics, very high data transfer rates can be achieved.		
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	A computer peripheral is simply an object or device designed to expand the functionality of a computer system. They are not the core components of the computer required to make it run, but they oftentimes make it easier to use the computer itself. Devices such as speakers, printers, scanners and webcams are all considered computer peripherals because they expand the functionality of the computer system itself. These devices usually work through the use of drivers, small programs designed to make the peripheral and your system work together in harmony. MAGNETIC DISK DRIVES A magnetic disk primarily consists of a rotating magnetic surface (called platter) and a mechanical arm that moves over it. The mechanical arm is used to read from and write to the disk using a magnetization process. The platter keeps spinning at high speed while the head of the arm moves across its surface. When a		Nield, D. (2016, September 29). *What is the advantage of a fanless computer?* Your Business. Retrieved January 28, 2022, from https://yourbusiness.azcentral.com/advantage-fanless-computer-11081.html Techopedia. (2020, September 21). *What is a magnetic disk? - definition from Techopedia*. Techopedia.com. Retrieved January 28, 2022, from https://www.techopedia.com/definition/8210/magnetic-disk Study.com	Take Online Courses. Earn College Credit. Research Schools, Degrees &

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important to limit the number of disk-read phases when writing programs. (Ch 10 p. 297)	small current is applied to the head, tiny spots on the disk surface are magnetized and data is stored. Vice-versa, a small current could be applied to those tiny spots on the platter when the head needs to read the data. Data is organized on the disk in the form of tracks and sectors, where tracks are the circular divisions of the disk. Tracks are further divided into sectors that contain blocks of data. All read and write operations on the magnetic disk are performed on the sectors. OPTICAL DISK DRIVES 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. Optical data storage is similar to magnetic disk: data is stored in blocks on the disk. The blocks can be arranged in files, with a directory structure similar to that of magnetic disks. However rather than concentric tracks, data on an optical disk is stored on a single track, approximately three miles long for a CD, and ten miles for a blu-ray DVD, which spirals from the inside of the disk to the outside. Instead of sectors, the data is stored in linear blocks along the track.		Careers. (n.d.). Retrieved January 28, 2022, from https://study.com/academy/lesson/what-is-an-optical-drive-definition-types-function.html#:~:text=An%20optical%20disk%20drive%20uses%20a%20laser%20to%20read%20and%20write%20data.&text=An%20optical%20drive%20that%20can,light%20reflection%20from%20the%20disc. Englander, I. (2014). Chapter 10 Computer Peripherals. In *The architecture of computer hardware and systems software: An information technology approach* (Fifth, p. 307). essay, Wiley.