Sri Venkateshwaraa College of Engineering & Technology





**Department of Computer Science and Engineering**

Subject Name: **COMPUTER HARDWARE AND NETWORK TROUBLESHOOTING**

Subject Code: **CS T72**

**Prepared By :**

Dr. N. Balaji, Professor & HOD / CSE

**Verified by :** **Approved by :**

**UNIT – I**

**Personal Computer:** Introduction–History of the Personal Computers–System Components - Dataflow inside the PC – Processor types and specifications – 16-bit to 64-bit evolution – specifications – Cache Memory – Processor Features: System Management Mode – Super scalar execution – Dynamic Execution - Dual independent bus architecture – Hyper threading – Dual and multi core technology - socket and slot types – Intel‘s Pentium and Core Processors – AMD K6 to K8 series processors.

**2 Marks**

1. **Define Personal Computer (PC)?**

A personal computer (PC) is any general-purpose  [computer](http://en.wikipedia.org/wiki/Computer) whose size, capabilities, and original sales price make it useful for individuals, and which is intended to be operated directly by an  [end](http://en.wikipedia.org/wiki/End-user)- [user](http://en.wikipedia.org/wiki/End-user) with no intervening computer operator**.**

1. **Draw the data flow diagram inside the PC?**

**1** **Computer Hardware and Network Troubleshooting**

Sri Venkateshwaraa College of Engineering & Technology

1. **Define PC System Design Guide?**

The PC System Design Guide (also known as the PC 97, PC 98, PC 99, or PC 2001 specification) is a series of hardware design requirements and recommendations for  [IBM PC compatible](http://en.wikipedia.org/wiki/IBM_PC_compatible)  [persona](http://en.wikipedia.org/wiki/Personal_computer)l  [computers,](http://en.wikipedia.org/wiki/Personal_computer) compiled by  [Microsoft](http://en.wikipedia.org/wiki/Microsoft) and  [Intel Corporation](http://en.wikipedia.org/wiki/Intel_Corporation) during 1997–2001.

1. **What is UMA and HMA?**

**Upper Memory Area (UMA):** This is the upper 384 KB of the first megabyte of system memory(immediately above conventional memory). It is reserved for use by system devices and for special uses such as ROM shadowing and drivers. It uses addresses A0000h to FFFFFh.

**High Memory Area (HMA):** This is the first 64 KB (less 16 bytes) of the second megabyte ofsystem memory. Technically this is the first 64 KB of extended memory, but it can be accessed when the processor is in real mode, which makes it different from the rest of extended memory. It is usually used for DOS, to allow more conventional memory to be preserved. It occupies addresses 100000h to 10FFEFh.

1. **Define Over clocking?**

Over clocking is the process of making a  [computer](http://en.wikipedia.org/wiki/Computer) or  [component](http://en.wikipedia.org/wiki/Computer_hardware) operate faster than specified by the manufacturer by modifying system parameters.

1. **What is Cache Memory? (NOV 2012)**

Cache memory is random access memory  [(RAM)](http://searchmobilecomputing.techtarget.com/definition/RAM) that a computer microprocessor can access more quickly than it can access regular RAM. As the microprocessor processes data, it looks first in the  [cache](http://searchstorage.techtarget.com/definition/cache) memory and if it finds the data there (from a previous reading of data), it does not have to do the more time-consuming reading of data from larger  [memory](http://searchmobilecomputing.techtarget.com/definition/memory).

1. **Clarify Super scalar execution?**

A superscalar  [CPU](http://www.techterms.com/definition/cpu) can execute more than one instruction per clock cycle. Because processing speeds are measured in clock cycles per second  [(megahertz),](http://www.techterms.com/definition/megahertz) a superscalar processor will be faster than a scalar processor rated at the same megahertz.

1. **What is processor? (NOV 2013)**

A *processor* is the logic circuitry that responds to and processes the basic instructions that drive a computer. The term *processor* has generally replaced the term central processing unit (CPU). The *processor* in a personal computer or embedded in small devices is often called a microprocessor.

1. **Define system clock? (NOV 2013)**

**system clock** that shows a time-of-day clock in a computer system**.** It is an electronic device in acomputer that issues a steady high-frequency signal that synchronizes all the internal components

1. **Write the Microprocessor Types and Specifications? Processor Types**

P1 (086) First-Generation Processors

P2 (286) Second-Generation Processors

P3 (386) Third-Generation Processors

P4 (486) Fourth-Generation Processors

**2** **Computer Hardware and Network Troubleshooting**

Sri Venkateshwaraa College of Engineering & Technology

P5 (586) Fifth-Generation Processors

Pseudo-Fifth-Generation Processors

P6 (686) Sixth-Generation Processors

Pseudo-Sixth-Generation Processors

P7 (786) Seventh-Generation Processors

Processor Upgrades

OverDrive Processors

OverDrive Processor Installation

OverDrive Compatibility Problems

Processor Benchmarks

**Processor Specifications**

Processor Speed Ratings

Data Bus

Internal Registers

Address Bus

Internal (Level 1) Cache

Processor Modes

Processor Features

Processor Manufacturing

Physical Packaging

Processor Sockets

CPU Operating Voltages

Heat and Cooling Problems

Math Coprocessors

Processor Bugs

Processor Update Features

Intel Processor Codenames

1. **Define Dual Independent Bus (DIB)**

Dual Independent Bus (DIB) is a  [processor architecture](http://en.wikipedia.org/wiki/CPU_design) that includes two  [buses:](http://en.wikipedia.org/wiki/Bus_%28computing%29) one to the main system  [memory](http://en.wikipedia.org/wiki/Computer_data_storage) and another to the level 2  [cache.](http://en.wikipedia.org/wiki/CPU_cache) The  [processor](http://en.wikipedia.org/wiki/Central_processing_unit) can access both simultaneously for improved performance. In Dual Independent Bus (DIB) architecture systems the single  [system bus](http://en.wikipedia.org/wiki/System_bus) is replaced by a  [back-side bus](http://en.wikipedia.org/wiki/Back-side_bus) for accessing level 2 cache, and a  [front-side bus](http://en.wikipedia.org/wiki/Front-side_bus) for communicating data between the CPU and main memory and input and output devices.

1. **What is Hyper-threading?**

Hyper-threading is a technology developed by Intel Corporation. It is used in certain Pentium 4 processors and all Intel Xeon processors. Hyper-threading technology, commonly referred to as "HT Technology," enables the processor to execute two threads, or sets of instructions, at the same time. Since hyper-threading allows two streams to be executed in parallel, it is almost like having two separate processors working together.

1. **What is Dual-core Technology?**

A single chip that contains two distinct processors that work simultaneously. IBM introduced dual cores in its Power 4 chips in 2000. In 2004, Sun and HP introduced their first dual core CPUs.

1. **Define Processor Codenames?**

Intel, AMD, and Cyrix have always used codenames when talking about future processors. The codenames usually are not supposed to become public, but they typically do. They can often be

**3** **Computer Hardware and Network Troubleshooting**

Sri Venkateshwaraa College of Engineering & Technology

found in online and print news and magazine articles talking about future-generation processors. Sometimes, they even appear in motherboard manuals because the manuals are written before the Processors are officially introduced.

1. **What is meant by Power Management?**

Power management is a feature of some electrical appliances, especially  [copiers,](http://en.wikipedia.org/wiki/Photocopying)  [computers](http://en.wikipedia.org/wiki/Computer) and computer  [peripherals](http://en.wikipedia.org/wiki/Peripheral) such as  [monitors](http://en.wikipedia.org/wiki/Computer_display) and  [printers,](http://en.wikipedia.org/wiki/Computer_printer) that turns off the power or switches the system to a low-power state when inactive. In computing this is known as  [PC power managemen](http://en.wikipedia.org/wiki/PC_power_management)t

1. **Explain the history of PC?**

The **history of personal computers** began in the 1970s. A personal computer is one intended for individual use, as opposed to a  [mainframe computer](http://en.wikipedia.org/wiki/Mainframe_computer) where the end user's requests are filtered through operating staff, or a  [time sharing](http://en.wikipedia.org/wiki/Time_sharing) system in which one large processor is shared by many individuals. After the development of the  [microprocessor,](http://en.wikipedia.org/wiki/Microprocessor) individual personal computers were low enough in cost that they eventually became affordable consumer goods. Early personal computers – generally called  [microcomputers](http://en.wikipedia.org/wiki/Microcomputers) – were sold often in  [electronic kit](http://en.wikipedia.org/wiki/Electronic_kit) form and in limited numbers, and were of interest mostly to hobbyists and technicians.

1. **Differentiate hardware and software?**

Hardware and software work together in digital devices and systems to provide computerized functionality. Hardware includes the physical components, such as the  [motherboard,](http://www.wisegeek.com/what-is-a-motherboard.htm) chips, memory, and hard drives, while software includes the programs that run on the hardware.

1. **What are the two types of hardware interrupts (NOV 2010)**

There are two basic types of hardware interrupts: Non Maskable Interrupts (NMI) and (maskable)

Interrupt Requests (IRQ)

**19. What is BIOS? (APR 2011), (NOV 2012)**

*BIOS* (*basic input/output system*) is the program a personal computer's microprocessor uses to get thecomputer system started after you turn it on. It also manages data flow between the computer's operating system and attached devices such as the hard disk, video adapter, keyboard, mouse and printer.

1. **List any four components of Mother Board? (APR 2011)**
	1. North Bridge
	2. Soth Bridge
	3. Chipset
	4. Processor Sockets
	5. Memory Slots
	6. Power Connectors
2. **Expand SMPS, DMA? (APR 2012)**

SMPS - switched-mode power supply

DMA - Direct memory access

**22. What are the types of memory? (APR 2012)**

The types of memory in a computer system are:

Cache Memory - This is a small amounts of memory used to speed up system performance.

**4** **Computer Hardware and Network Troubleshooting**

Sri Venkateshwaraa College of Engineering & Technology

Main memory - This is the RAM (random access memory)

Secondary memory - This is a magnetic storage that keeps applications and data available to be used, and may also serves as virtual memory depending upon the operating system

1. **List out the Hardware components of PC? (NOV 2012)**
	* Power Supply
	* Motherboard
	* Microprocessor.
	* Memory
	* Drive controllers
	* Hard disk drive(s)
	* CD-ROM drive(s)
	* Floppy drive(s)
	* Monitor
	* Keyboard
	* Mouse
2. **Define computer? (NOV 2012)**

A computer is a device that accepts  [information](http://searchsqlserver.techtarget.com/definition/information) (in the form of  [digitalized](http://searchcio-midmarket.techtarget.com/definition/digital)  [data)](http://searchdatamanagement.techtarget.com/definition/data) and manipulates it for some result based on a  [program](http://searchsoftwarequality.techtarget.com/definition/program) or sequence of instructions on how the data is to be processed. Complex computers also include the means for storing data (including the program, which is also a form of data) for some necessary duration. A program may be invariable and built into the computer (and called *logic circuitry* as it is on  [microprocessors)](http://searchcio-midmarket.techtarget.com/definition/microprocessor) or different programs may be provided to the computer (loaded into its storage and then started by an administrator or user). Today's computers have both kinds of programming.

1. **Why is the maximum value in decimal that can be represented by an eight bit binary number?( NOV 2014)**

Each character can be converted to its equivalent ASCII code. That ASCII code will be stored in the memory in 8 bit form.

1. **If the number of bits in MAR is 10, What is the maximum memory capacity? (NOV 2014)**

210 = 1024 locations

0000000000 -> location no. 0

0000000001 -> location no. 1

…..

1111111111 -> Location no.1023

So totally 1024 locations

**5** **Computer Hardware and Network Troubleshooting**

Sri Venkateshwaraa College of Engineering & Technology

**11 MARKS**

**Personal Computer:**

A personal computer (PC) is comprised of hardware, Operating system and software. Each of these components is fairly complex; However

**The Hardware:** The most fundamental elements of a PC‘s hardware are the central processing unit(CPU)and memory modules mounted on the motherboard. When the PC is powered on, the CPU begins communicating with motherboard and starts the basic input output system(BIOS) which is stored on a chip on the motherboard. After verifying that the required components are present and functioning, it may check the floppy drive, hard disk or CD ROM for the presence of an OS. Other common examples of hardware which may be a part of a PC include a modem, soundcard, network card and video card. The components attached outside of the computer such as the keyboard, mouse, printer and monitor are called peripherals.

**The Operating System:** The OS is responsible for everything from enabling hardware components tofunction to how to communicate with the internet as well as playing the role of traffic cop for all the software.

The OS allocates the resources of the PC to the software and hardware in an organized way. The resources include things like memory storage space, access to the hard disk and what is displayed on the monitor. Without the OS, the software programs might interface with each other, causing the PC to malfunction or crash continually. Even with the OS, many PCs have difficulty operating smoothly.

**The software:** While the OS is technically a software program it is distinct from other softwarespecifically referred to as‖Application Software‖. Application software, we‘ll just call it software are programs that you install onto a PC that make the PC useful.

Software is a complex series of instructions telling the computer what to do. The instructions are very detailed because they have to tell the computer every single step to be performed. For example a word processing program has instructions for what to do when you press the letter ‗A‘. The software tells the computer to take the letters you already typed and it tells he computer to display the letters on the screen so you can see what you have typed. The computer doesnot do anything without very explicit instructions.

**1. Explain briefly about History of the PC**

|  |  |  |
| --- | --- | --- |
| 1617 | - | John Napier creates ―Napier‘s Bones‖ wood (or) Ivory rods used for calculation. |
| 1642 | - | Blaise Pascal introduces the Pascaline digital adding machine. |
| 1822 | - | Charles Babbage introduces the difference engine and later the analytical engine, a true |
|  |  | general purpose computing machine. |
| 1937 | - | John V Atanesoff begins work on the Atanasoff Berry Computer(ABC). First electronic |
|  |  | computer,uses tubes, transistors,Selenoids and relays. |
| 1945 | - | John Von Neuman writes ―First draft of a report on the EDVAC‖, architecture of the |
|  |  | modern stored program computer. |
| 1946 | - | ENIAC is introduced by John Mouchly and J.Prespe Eckert. |
| 1949 | - | Maurice wilkes assembles the EDSAC, First practical stored program computer at |
|  |  | Cambridege University. |

**6** **Computer Hardware and Network Troubleshooting**

Sri Venkateshwaraa College of Engineering & Technology

1953 - IBM ships its first electronic computer the 701.

1955 - Bell laboratories announces the first fully transistorised computer, TRADIC.

1956 - MIT researchers build TX-0, the first general purpose, programmable computer build with transistors.

1959 - IBM‘s 7000 series mainframes are the company‘s first transitorised computer.

1960 - Bell labs designs its Dataphone, the first commercial modem specifically for converting digital data to analog signals for transmission across long distnce network.

1964 - Online transaction processing makes its debut in IBM‘s SABRE reservation system, setup for American Airlines.

1969 - Internet begins when the department of defence establishes 4 nodes on the ARPANET, two at University of Californiacampuses and one each at Sri international and the University of Utah.

1971 - A team at IBM‘s Sanjose labortories invents 8‖ floppy disk.

1974 - Xerox Palo Alto research centre design the Alto, the first workstation with a built in mouse for input.

1975 - Telenet, the first commercial packet switching network and civilian equivalent of ARPANE is born.

1976 - Steve Wozniak designs the Apple I, a single board computer.

1980 - Seagate technology creates the first hard disk drive for micro computers, ST-506. 1981 - The first optical data storage disk has 60 times the capacity of 5¼‖ floppy disk. 1981 - Xerox introduces PC with graphical user interface(GUI)

1981 - Sony introduces the first 3 ½ ― FDD.

1981 - Adam Osborne completes the first portable computer OsborneJ, which weighs 24 lbs and cost $1,795.

1981 - Philips and Sony introduces the CD-DA format(Compact Disk Digital Audio) 1982 - Sony is the first with a CD Player on the market.

1983 - Compaque introduces its first PC clone that uses the same software as the IBM PC. 1990 - The world wide web is born when Tim Borners –Lee develops HTML.

1993 - Intel releases Pentium 5 processor.

1995 - Intel releases Pentium 6 processor.

1995 - Microsoft releases Windows 95, the first mainstream 32bit OS. 1997 - Intel releases Pentium III processor.

**7** **Computer Hardware and Network Troubleshooting**

Sri Venkateshwaraa College of Engineering & Technology

1998 - Microsoft releases Windows 98.

1998 - AMD releases Athlon.

1999 - IEEE officially approves the 5Ghz band 802.11a 54mbps and 2.4Ghz band 802.11b 11mbps wireless networking standards.

2000 - The first 802.11b wi-fi certified products are introduced. 2000 - Microsoft releases Windows ME and Windows

2001 - Microsoft releases Windows XP.

2006 - Microsoft releases Windows Vista.

2009 - Microsoft releases Windows 7.

2012 - Microsoft releases Windows 8.

2013 - Microsoft releases Windows 8.1

2015 - Microsoft releases Windows 10

**2. Draw the functional Block diagram of the PC and explain its parts (APR 2011)**

A computer system consists of mainly four basic units; namely input unit, storage unit, central processing unit and output unit. Central Processing unit further includes Arithmetic logic unit and control unit, as shown in the figure:.



A computer performs five major operations or functions irrespective of its size and make. These are

* it accepts data or instructions as input,
* it stores data and instruction
* it processes data as per the instructions,
* it controls all operations inside a computer, and
* it gives results in the form of output.

**8** **Computer Hardware and Network Troubleshooting**

Sri Venkateshwaraa College of Engineering & Technology

**Desktop Computer System**

**Functional Units:**

1. **Input Unit**: This unit is used for entering data and programs into the computer system by the user forprocessing.

**Basic Computer Organisation**

1. **Storage Unit**: The storage unit is used for storing data and instructions before and after processing.
2. **Output Unit:** The output unit is used for storing the result as output produced by the computer afterprocessing.
3. **Processing:** The task of performing operations like arithmetic and logical operations is calledprocessing. The Central Processing Unit (CPU) takes data and instructions from the storage unit and makes all sorts of calculations based on the instructions given and the type of data provided. It is then sent back to the storage unit. CPU includes Arithmetic logic unit (ALU) and control unit (CU)

**Computer Chip**

**• Arithmetic Logic Unit:** All calculations and comparisons, based on the instructions provided, arecarried out within the ALU. It performs arithmetic functions like addition, subtraction, multiplication, division and also logical operations like greater than, less than and equal to etc.

**• Control Unit:** Controlling of all operations like input, processing and output are performed by controlunit. It takes care of step by step processing of all operations in side the computer.

**Memory**

Computer‘s memory can be classified into two types; primary memory and secondary memory

**RAM**

a. Primary Memory can be further classified as **RAM and ROM**.

* **RAM** or Random Access Memory is the unit in a computer system. It is the place in a computer wherethe operating system, application programs and the data in current use are kept temporarily so that they can be accessed by the computer‘s processor. It is said to be ‗volatile‘ since its contents are accessible only as long as the computer is on. The contents of RAM are no more available once the computer is turned off.
* **ROM** or Read Only Memory is a special type of memory which can only be read and contents ofwhich are not lost even when the computer is switched off. It typically contains manufacturer‘s instructions. Among other things, ROM also stores an initial program called the ‗bootstrap loader‘ whose function is to start the operation of computer system once the power is turned on.

**b. Secondary Memory**

RAM is volatile memory having a limited storage capacity. Secondary/auxiliary memory is storage other than the RAM. These include devices that are peripheral and are connected and controlled by the computer to enable permanent storage of programs and data.

Secondary storage devices are of two types; magnetic and optical. Magnetic devices include hard disks and optical storage devices are CDs, DVDs, Pen drive, Zip drive etc.

* **Hard Disk** are made up of rigid material and are usually a stack of metal disks sealed in a box. The harddisk and the hard disk drive exist together as a unit and is a permanent part of the computer where data and programs are saved. These disks have storage capacities ranging from 1GB to 80 GB and more. Hard disks are rewritable.
* **Compact Disk (CD)** is portable disk having data storage capacity between 650-700 MB. It can holdlarge amount of information such as music, full-motion videos, and text etc. CDs can be either read only or read write type.
* Digital Video Disk (DVD) is similar to a CD but has larger storage capacity and enormous clarity. Depending upon the disk type it can store several Gigabytes of data. DVDs are primarily used to store music or movies and can be played back on your television or the computer too. These are not rewritable.

**Input / Output Devices:**

These devices are used to enter information and instructions into a computer for storage or processing and to deliver the processed data to a user. Input/Output devices are required for users to communicate with the computer. In simple terms, input devices bring information INTO the computer and output devices bring information OUT of a computer system. These input/output devices are also known as peripherals since they surround the CPU and memory of a computer system.

**9** **Computer Hardware and Network Troubleshooting**

Sri Venkateshwaraa College of Engineering & Technology

**Input Devices**

An input device is any device that provides input to a computer. There are many input devices, but the two most common ones are a keyboard and mouse. Every key you press on the keyboard and every movement or click you make with the mouse sends a specific input signal to the computer.

* **Keyboard**: The keyboard is very much like a standard typewriter keyboard with a few additional keys.The basic QWERTY layout of characters is maintained to make it easy to use the system. The additional keys are included to perform certain special functions. These are known as function keys that vary in number from keyboard to keyboard.
* **Mouse**: A device that controls the movement of the cursor or pointer on a display screen. A mouse is asmall object you can roll along a hard and flat surface. Its name is derived from its shape, which looks a bit like a mouse. As you move the mouse, the pointer on the display screen moves in the same direction.
* **Trackball**: A trackball is an input device used to enter motion data into computers or other electronicdevices. It serves the same purpose as a mouse, but is designed with a moveable ball on the top, which can be rolled in any direction.
* **Touchpad**: A touch pad is a device for pointing (controlling input positioning) on a computer displayscreen. It is an alternative to the mouse. Originally incorporated in laptop computers, touch pads are also being made for use with desktop computers. A touch pad works by sensing the user‘s finger movement and downward pressure. • Touch Screen: It allows the user to operate/make selections by simply touching the display screen. A display screen that is sensitive to the touch of a finger or stylus. Widely used on ATM machines, retail point-of-sale terminals, car navigation systems, medical monitors and industrial control panels.
* **Light Pen**: Light pen is an input device that utilizes a light-sensitive detector to select objects on adisplay screen.
* **Magnetic ink character recognition (MICR)**: MICR can identify character printed with a special inkthat contains particles of magnetic material. This device particularly finds applications in banking industry.
* **Optical mark recognition (OMR)**: Optical mark recognition, also called mark sense reader is atechnology where an OMR device senses the presence or absence of a mark, such as pencil mark. OMR is widely used in tests such as aptitude test.
* **Bar code reader**: Bar-code readers are photoelectric scanners that read the bar codes or vertical zebrastrips marks, printed on product containers. These devices are generally used in super markets, bookshops etc.

**Scanner** Scanner is an input device that can read text or illustration printed on paper and translates theinformation into a form that the computer can use. A scanner works by digitizing an image.

**Output Devices:**

Output device receives information from the CPU and presents it to the user in the desired from. The processed data, stored in the memory of the computer is sent to the output unit, which then converts it into a form that can be understood by the user. The output is usually produced in one of the two ways – on the display device, or on paper (hard copy).

•**Monitor**: is often used synonymously with ―computer screen‖ or ―display.‖ Monitor is an output device that resembles the television screen (fig. 1.8). It may use a Cathode Ray Tube (CRT) to display information. The monitor is associated with a keyboard for manual input of characters and displays the information as it is keyed in. It also displays the program or application output. Like the television, monitors are also available in different sizes.

* **Printer**: Printers are used to produce paper (commonly known as hard copy) output. Based on thetechnology used, they can be classified as Impact or Non-impact printers.

Impact printers use the typewriting printing mechanism wherein a hammer strikes the paper through a ribbon in order to produce output. Dot-matrix and Character printers fall under this category.

Non-impact printers do not touch the paper while printing. They use chemical, heat or electrical signals to etch the symbols on paper. Inkjet, DeskJet, Laser, Thermal printers fall under this category of printers.

* **Plotter**: Plotters are used to print graphical output on paper. It interprets computer commands andmakes line drawings on paper using multi colored automated pens. It is capable of producing graphs, drawings, charts, maps etc.
* **Facsimile (FAX)**: Facsimile machine, a device that can send or receive pictures and text over atelephone line. Fax machines work by digitizing an image.

**10** **Computer Hardware and Network Troubleshooting**

Sri Venkateshwaraa College of Engineering & Technology

• **Sound cards and Speaker(s)**: An expansion board that enables a computer to manipulate and output sounds. Sound cards are necessary for nearly all CD-ROMs and have become commonplace on modern personal computers. Sound cards enable the computer to output sound through speakers connected to the board, to record sound input from a microphone connected to the computer, and manipulate sound stored on a disk.

1. **Explain briefly about Data Flow inside the PC**

The flow of data through our computer and discover exactly what happens to the data along this

journey. There are four devices involved in the flow of data through your computer.

**Input Devices** - These are devices used by the operator to send data into the computer. Some basicexamples of input devices would be your keyboard and mouse.

**CPU -** (Central Processing Unit) This is the brain of your computer and where all the processing of datatakes place.

**Storage** - This is a device used to store data either permanently or temporarily. Some examples of storagedevices are Main Memory, ROM, RAM and floppy disc.

**Output** - An output device sends processed information from the computer to the operator. Some basicexamples would be your monitor and your printer.

Now that we know the devices involved in our data flow lets start our journey. We can think of our data flow like a trip to the doctor.Our operator will input the letter d into his word processing program using his keyboard.This could be compared to our doctor's receptionist taking our information.Our keyboard contains a small chip that has the binary codes for each key stored. This binary code is then sent to our computers RAM.Think of this as the receptionist giving our information to the nurse.The easiest way to think of RAM is as a temporary storage bin where data waits to be processed. Our d is now sitting in our storage bin waiting for the computer to send it to the CPU.This would be much like our information being put into the pile until the doctor is ready to see us.



The CPU will read the binary code and follow the coded instructions. These instructions tell the CPU where to send the data next. In this case our d will be sent to our graphic card and then displayed on our screen.The CPU would be like our doctor examining us, deciding on a treatment, and carrying it out.

**11** **Computer Hardware and Network Troubleshooting**

Sri Venkateshwaraa College of Engineering & Technology

Input a Operator types the letter d on the keyboard. a The keyboard sends binary codes for our letter to our RAM a Our letter d waits in RAM until the CPU is ready to process it a Our CPU reads the binary code and sends it to our graphics card a Our graphic card displays our letter d on our monitor a Output

1. **Explain briefly about Microprocessor Types and Specifications**
2. **Explain the types of Microprocessor. (NOV 2013)**
3. **Describe the specifications of processors. (NOV 2014) Microprocessors**

The brain or engine of the PC is the processor (sometimes called microprocessor), or central

processing unit (CPU). The CPU performs the system‘s calculating and processing. The processor is easily the most expensive single component in the system, costing up to four or more times greater than the motherboard it plugs into. Intel is generally credited with creating the first microprocessor in 1971 with the introduction of a chip called the 4004. Today Intel still has control over the processor market, at least for PC systems. This means that all PC-compatible systems use either Intel processors or Intel-compatible processors from a handful of competitors (such as AMD or Cyrix).

It is interesting to note that the microprocessor had only existed for 10 years prior to the creation of the PC! The microprocessor was invented by Intel in 1971. The PC was created by IBM in 1981. Now nearly 20 years later, we are still using systems based more or less on the design of that first PC (and mostly backward compatible with it). The processors powering our PCs today are still backward compatible in many ways with the 8088 selected by IBM in 1981.

**Processor Specifications**

Processors can be identified by two main parameters: how wide they are and how fast they are. The speed of a processor is a fairly simple concept. Speed is counted in megahertz (MHz), which means millions of cycles per second—and faster is better! The width of a processor is a little more complicated to discuss because there are three main specifications in a processor that are expressed in width. They are

* Internal registers
* Data input and output bus
* Memory address bus

**Intel Processor Specifications**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Process** | **Proce** | **Cloc** | **Voltag** | **Register** | **Data** | **Max.** | **L1** | **L2** | **L** | **Mul.** | **Transist** |
| **or** | **ss** | **k** | **e** | **s** | **Bus** | **Memo** |  |  | **3** | **Instr** | **ors** |
|  |  |  |  |  |  | **ry** |  |  |  | **u.** |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| 8088 | 3.0 | 1x | 5v | 16 bit | 8 bit | 1MB | - | - | - | - | 29,000 |
|  |  |  |  |  |  |  |  |  |  |  |  |
| 8086 | 3.0 | 1x | 5v | 16 bit | 16 bit | 1MB | - | - | - | - | 29,000 |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Pentium | 0.35 | 2x+ | 3.3v | 32 bit | 64 bit | 64GB | 2x8K | 256 | - | - | 5.5M |
| Pro |  |  |  |  |  |  | B | KB, |  |  |  |
|  |  |  |  |  |  |  |  | 512 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |

**12** **Computer Hardware and Network Troubleshooting**

Sri Venkateshwaraa College of Engineering & Technology

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  | KB, |  |  |  |  |
|  |  |  |  |  |  |  |  | 1MB |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| Pentium | 0.35 | 3.5x | 2.8v | 32 bit | 64 bit | 64GB | 2x16 | 512 | - | MM | 7.5M |  |
| II |  | + |  |  |  |  | KB | KB, |  | X |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| Celeron | 0.25 | 3.5x | 1.8v- | 32 bit | 64 bit | 64GB | 2x16 | 0KB | - | MM | 7.5M |  |
|  |  | + | 2.8v |  |  |  | KB | , |  | X |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| Pentium | 0.25 | 4x+ | 2.0v- | 32 bit | 64 bit | 64GB | 2x16 | 256 | - | SSE | 44M5 |  |
| III |  |  | 2.05v |  |  |  | KB | KB, |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| Pentium | 0.18 | 3x+ | 1.7v | 32 bit | 64 bit | 64GB | 12+8 | 256 | - | SSE2 | 42M |  |
| IV |  |  |  |  |  |  | KB | KB, |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| Core 2 | 0.065 | 1.75 | 0.9v- | 64bit | 64 bit | 1TB | 2x32 | 1/2 | - | SSE3 | 291M |  |
| Duo |  | x+ | 1.3v |  |  |  | KB(x | MB( |  |  |  |  |
|  |  |  |  |  |  |  | 2) | x2) |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| **AMD Processor Specifications** |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Process** | **Proce** | **Cloc** | **Voltag** | **Register** | **Data** | **Max.** | **L1** | **L2** | **L** | **Mul.** | **Transist** |  |
| **or** | **ss** | **k** | **e** | **s** | **Bus** | **Memo** |  |  | **3** | **Instr** | **ors** |  |
|  |  |  |  |  |  | **ry** |  |  |  | **u.** |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| AMD | 0.35 | 1.5x | 3.5v | 32 bit | 64 bit | 4GB | 16+8 | - | - | - | 4.3M |  |
| K5 |  | + |  |  |  |  | KB |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| AMD | 0.25 | 5x+ | 1.6v- | 32 bit | 64 bit | 4GB | 2x64 | 512 | - | Enh.3 | 32M |  |
| ATHLO |  |  | 1.8v |  |  |  | KB | KB, |  | D |  |  |
| N |  |  |  |  |  |  |  |  |  | now |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| AMD | 0.13 | 5x+ | 1.5- | 32 bit | 64 bit | 4GB | 2x64 | 256 | - | 3D | 32.2M |  |
| ATHLO |  |  | 1.8v |  |  |  | KB | KB, |  | Now! |  |  |
| N XP |  |  |  |  |  |  |  |  |  | Pro |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |

1. **What is Cache memory? Explain in detail.**

Cache memory is random access memory  [(RAM)](http://searchmobilecomputing.techtarget.com/definition/RAM) that a computer microprocessor can access more quickly than it can access regular RAM. As the microprocessor processes data, it looks first in the

 [cache](http://searchstorage.techtarget.com/definition/cache) memory and if it finds the data there (from a previous reading of data), it does not have to do the more time-consuming reading of data from larger  [memory](http://searchmobilecomputing.techtarget.com/definition/memory).

Cache memory is fast and expensive. Traditionally, it is categorized as "levels" that describe its closeness and accessibility to the microprocessor:

* **Level 1 (**[L](http://whatis.techtarget.com/definition/L1-and-L2)1**) cache** is extremely fast but relatively small, and is usually embedded in the processorchip (CPU).

**13** **Computer Hardware and Network Troubleshooting**

Sri Venkateshwaraa College of Engineering & Technology

* **Level 2 (L2) cache** is often more capacious than L1; it may be located on the CPU or on a separatechip or  [coprocessor](http://whatis.techtarget.com/definition/coprocessor) with a high-speed alternative system bus interconnecting the cache to the CPU, so as not to be slowed by traffic on the main system bus.
* **Level 3 (L3) cache** is typically specialized memory that works to improve the performance of L1 andL2. It can be significantly slower than L1 or L2, but is usually double the speed of RAM. In the case of  [multicore processors,](http://searchdatacenter.techtarget.com/definition/multi-core-processor) each core may have its own dedicated L1 and L2 cache, but share a common L3 cache. When an instruction is referenced in the L3 cache, it is typically elevated to a higher tier cache.



1. **Explain the features of Processors. (NOV 2014)**
2. **Explain the Following : a) System Management Mode b)Super Scalar Execution c) Dynamic Execution d) Dual Independent Bus (DIB) e)Hyper-Threading f)Dual and Multi-Core Technology**

**System Management Mode:**

**System Management Mode** (**SMM**, sometimes called **ring -2**) is an operating mode of  [x86](https://en.wikipedia.org/wiki/X86)  [centra](https://en.wikipedia.org/wiki/Central_processor_unit)l [processor units](https://en.wikipedia.org/wiki/Central_processor_unit) (CPUs) in which all normal execution, including the  [operating system,](https://en.wikipedia.org/wiki/Operating_system) is suspended and special separate  [software,](https://en.wikipedia.org/wiki/Software) which is usually part of the  [firmware](https://en.wikipedia.org/wiki/Firmware) or a hardware-assisted  [debugger,](https://en.wikipedia.org/wiki/Debugger) is executed with high privileges.

It was first released with the  [Intel 386SL.](https://en.wikipedia.org/wiki/Intel_386SL) While initially special SL versions were required for SMM, Intel incorporated SMM in its mainline 486 and Pentium processors in 1993.  [AMD](https://en.wikipedia.org/wiki/AMD) implemented Intel's SMM with the Enhanced  [Am486](https://en.wikipedia.org/wiki/Am486) processors in 1994. It is available in all later  [microprocessors](https://en.wikipedia.org/wiki/Microprocessor) in the x86  [architecture](https://en.wikipedia.org/wiki/Computer_architecture).

A Special mode of operation, where

* All the special tasks like power management, error handling and any specific platform related operations are performed.
* Entered in SMM by invoking SMI(System Management Interrupt).

**14** **Computer Hardware and Network Troubleshooting**

Sri Venkateshwaraa College of Engineering & Technology

* Saves all the context of current task in execution.
* Executes the handler located in SMRAM.
* SMRAM is a special memory which is accessible in SMM but not accessible in normal execution made.
* Returns to normal execution by executing instruction RSM.
* SMBASE is re locatable to SMRAM address spase.

**SUPERSCALAR EXECUTION**

The fifth-generation Pentium and newer processors feature multiple internal instruction execution pipelines, which enable them to execute multiple instructions at the same time. The 486 and all preceding chips can perform only a single instruction at a time. Intel calls the capability to execute more than one instruction at a time superscalar technology. This technology provides additional performance compared with the 486.

The super scalar technique is identifying characteristics:

* Instructions are issued from a sequential instruction stream.
* CPU hardware dynamically checks for data dependencies between instructions at runtime.
* CPU accepts multiple instructions per cycle.

**DYNAMIC EXECUTION**

First used in the P6 or sixth-generation processors, dynamic execution is an innovative combination of three processing techniques designed to help the processor manipulate data more efficiently. Those techniques are multiple branch prediction, data flow analysis, and speculative execution. Dynamic execution enables the processor to be more efficient by manipulating data in a more logically ordered fashion rather than simply processing a list of instructions, and it is one of the hallmarks of all sixth-generation processors.

The way software is written can dramatically influence a processor's performance. For example, performance will be adversely affected if the processor is frequently required to stop what it is doing and jump or branch to a point elsewhere in the program. Delays also occur when the processor cannot process a new instruction until the current instruction is completed. Dynamic execution allows the processor to not only dynamically predict the order of instructions, but execute them out of order internally, if necessary, for an improvement in speed.

**DUAL INDEPENDENT BUS (DIB)**

**Dual Independent Bus (DIB)** is a  [processor architecture](http://en.wikipedia.org/wiki/CPU_design) thatincludes two  [buses:](http://en.wikipedia.org/wiki/Bus_%28computing%29) oneto the main system

 [memory](http://en.wikipedia.org/wiki/Computer_data_storage) and another to the level 2  [cache.](http://en.wikipedia.org/wiki/CPU_cache) The  [processor](http://en.wikipedia.org/wiki/Central_processing_unit) can access both simultaneously for improved

performance.

In Dual Independent Bus (DIB) architecture systems the single  [system bus](http://en.wikipedia.org/wiki/System_bus) is replaced by a  [back-side bu](http://en.wikipedia.org/wiki/Back-side_bus)s

for accessing level 2 cache, and a  [front-side bus](http://en.wikipedia.org/wiki/Front-side_bus) for communicating data between the CPU and main

memory and input and output devices.

**15** **Computer Hardware and Network Troubleshooting**

Sri Venkateshwaraa College of Engineering & Technology

**HYPER THREADING**

Hyper-Threading is a technology used by some Intel  [microprocessor](http://searchcio-midmarket.techtarget.com/definition/microprocessor) s that allows a single microprocessor to act like two separate processors to the  [operating system](http://searchcio-midmarket.techtarget.com/definition/operating-system) and the  [application program](http://searchsoftwarequality.techtarget.com/definition/application-program) s that use it. It is a feature of Intel's  [IA-32](http://searchsoftwarequality.techtarget.com/definition/application-program) processor architecture.

With Hyper-Threading, a microprocessor's "core" processor can execute two (rather than one) concurrent streams (or  [thread](http://searchcio-midmarket.techtarget.com/definition/thread) s) of instructions sent by the operating system. Having two streams of execution units to work on allows more work to be done by the processor during each  [clock cycle](http://searchwinit.techtarget.com/definition/clock-cycle) . To the operating system, the Hyper-Threading microprocessor appears to be two separate processors. Because most of today's operating systems (such as Windows and Linux) are capable of dividing their work load among multiple processors (this is called symmetric multiprocessing or  [SMP](http://searchdatacenter.techtarget.com/definition/SMP) ), the operating system simply acts as though the Hyper-Threading processor is a pool of two processors.

**DUAL AND MULTI-CORE TECHNOLOGY**

Dual core technology is basically putting two processors on a single chip.  [Dual Core Processor](http://www.trivology.com/articles/92/what-is-a-dual-core-processor.html) is between a single core processor and a dual processor system for architecture. Dual core technology has two processors but it does not mean that it will be providing double performance in all the areas to the user. It has two cores but shares some of the hardware like the memory controller and bus while a dual processor system has completely separate hardware and shares nothing with the other processor.

Multi-core processors may have:

* two cores (dual-core CPUs, for example,  [AMD Phenom II X2](https://en.wikipedia.org/wiki/List_of_AMD_Phenom_microprocessors#.22Callisto.22_.28C2.2FC3.2C_45_nm.2C_Dual-core.29) and  [Intel Core Duo](https://en.wikipedia.org/wiki/Intel_Core_Duo))
* three cores (tri-core CPUs, for example,  [AMD Phenom II X3](https://en.wikipedia.org/wiki/List_of_AMD_Phenom_microprocessors#.22Heka.22_.28C2.2FC3.2C_45_nm.2C_Tri-core.29))
* four cores (quad-core CPUs, for example,  [AMD Phenom II X4,](https://en.wikipedia.org/wiki/List_of_AMD_Phenom_microprocessors#.22Zosma.22_.28E0.2C_45_nm.2C_Quad-core.29) Intel's  [i5](https://en.wikipedia.org/wiki/Intel_Core_i5) and  [i7](https://en.wikipedia.org/wiki/Intel_Core_i7) processors)
* six cores (hexa-core CPUs, for example,  [AMD Phenom II X6](https://en.wikipedia.org/wiki/List_of_AMD_Phenom_microprocessors#.22Thuban.22_.28E0.2C_45_nm.2C_Hexa-core.29) and  [Intel Core i7 Extreme Editio](https://en.wikipedia.org/wiki/Gulftown)n  [980X](https://en.wikipedia.org/wiki/Gulftown))
* eight cores (octa-core CPUs, for example,  [Intel Core i7 5960X Extreme Edition](https://en.wikipedia.org/wiki/Haswell_%28microarchitecture%29) and  [AMD FX](https://en.wikipedia.org/wiki/List_of_AMD_FX_microprocessors)- [8350](https://en.wikipedia.org/wiki/List_of_AMD_FX_microprocessors))
* ten cores (deca-core CPUs, for example,  [Intel Xeon E7-2850](https://en.wikipedia.org/wiki/List_of_Intel_Xeon_microprocessors#.22Westmere-EX.22_.2832_nm.29_Expandable))

**16** **Computer Hardware and Network Troubleshooting**

Sri Venkateshwaraa College of Engineering & Technology

1. **Explain with neat diagram socket and slot types of Intel’s Pentium and core processors and AMD K6 to K8 processors.**

Intel and AMD have created a set of socket and slots for their processors. Each socket or slot is designed to support a different range of original and upgrade processors. The table below shows the designations for the various standard processor sockets/slots and lists the chips that drop into them.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Chip Class |  | Socket | Pins |  | Layout |
|  |  |  |  |  |  |

|  |  |
| --- | --- |
| Supported Processors | Introduced |
|  |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | 423 | 423 |  | 39x39 |  |
|  |  |  |  |  | SPGA |  |
|  |  |  |  |  |  |
|  |  | 478 | 478 |  | 26x26 |  |
|  |  |  |  |  | mPGA |  |
|  |  |  |  |  |  |  |
|  |  | T (LGA 775) | 775 |  | 30x33 |  |
|  |  |  |  |  | LGA |  |
| Intel |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  | LGA 1156 | 1156 |  | 40x40 |  |
| P4/Core |  |  |  |
|  | (Socket H) |  | LGA |  |
|  |  |  |  |  |  |  |
|  |  | LGA 1136 | 1366 |  | 41x43 |  |
|  |  | (Socket B) |  |  | LGA |  |
|  |  |  |  |  |  |  |
|  |  | LGA 1155 | 1155 |  | 40x40 |  |
|  |  | (Socket H2) |  | LGA |  |
|  |  |  |  |  |  |  |
|  |  | LGA 2011 | 2011 |  | 58x43 |  |
|  |  |  |  |  | hexLGA |  |
|  |  |  |  |  |  |
|  |  | 754 | 754 |  | 29x29 |  |
|  |  |  |  |  | mPGA |  |
|  |  |  |  |  |  |
|  |  | 939 | 939 |  | 31x31 |  |
|  |  |  |  |  | mPGA |  |
|  |  |  |  |  |  |  |
|  |  | 940 | 940 |  | 31x31 |  |
|  |  |  | mPGA |  |
|  |  |  |  |  |  |  |
|  |  | AM2 | 940 |  | 31x31 |  |
| AMD K8 |  |  |  |  | mPGA |  |
|  |  |  |  | 31x31 |  |
|  | AM2+ | 940 |  |  |
|  |  |  |  |
|  |  |  | mPGA |  |
|  |  |  |  |  |  |  |
|  |  | AM3 | 9412 |  | 31x31 |  |
|  |  |  |  |  | mPGA |  |
|  |  |  |  |  |  |  |
|  |  | AM3+ | 9412 |  | 31x31 |  |
|  |  |  | mPGA |  |
|  |  |  |  |  |  |  |
|  |  | F (1207 FX) | 1207 |  | 35x35 |  |
|  |  |  | LGA |  |
|  |  |  |  |  |  |  |
|  |  | FM1 | 905 |  | 31x31 |  |
| AMD A |  |  | LGA |  |
|  |  |  |  | 31x31 |  |
|  | FM2 | 904 |  |  |
|  |  |  |  |
|  |  |  | LGA |  |

Pentium 4 FC-PGA

Pentium 4/Celeron FC-PGA2, Celeron D

Pentium 4/Extreme Edition, Pentium D, Celeron D, Pentium dual-core, Core2

Pentium, Core i3/i5/i7, Xeon

Core i7, Xeon

Core i7, i5, i3

Core i7

Athlon 64

Athlon 64 v.2

Athlon 64 FX, Opteron

Athlon 64/64FX/64 X2, Sempron, Opteron, Phenom

Athlon 64/64 X2, Opteron, Phenom

X2/X3/X4, II X4

Athlon II, Phenom II, Sempron

"Bulldozer" Processors

Athlon 64 FX, Opteron

A4, A6, A8, Athlon II, E2, Sempron A4, A6, A8, A10

Nov. 2000

Oct. 2001

June 2004

Sept.

2009

Nov. 2008

Jan. 2011

Nov. 2011

Sept.

2003

June 2004

Apr. 2003

May 2006

Nov. 2007

Feb. 2009

Mid-2011

Aug. 2006

Jul. 2011

Sept.

2012

**17** **Computer Hardware and Network Troubleshooting**

Sri Venkateshwaraa College of Engineering & Technology

Sockets 1, 2, 3, and 6 are 486 processor sockets and are shown together in the figure below so you can see the overall size comparisons and pin arrangements between these sockets.



486 Processor Sockets

Sockets 4, 5, 7, and 8 are Pentium and Pentium Pro processor sockets and are shown together in the figure below so you can see the overall size comparisons and pin arrangements between these sockets.



Pentium And Pentium Pro Processor Sockets

When the Socket 1 specification was created, manufacturers realized that if users were going to upgrade processors, they had to make the process easier. The socket manufacturers found that 100 lbs. of insertion force is required to install a chip in a standard 169-pin Socket 1 motherboard. With this much force involved, you easily could damage either the chip or the socket during removal or reinstallation. Because of this, some motherboard manufacturers began using low insertion force (LIF) sockets, which required a smaller 60 lbs. of insertion force for a 169-pin chip. Pressing down on the motherboard with 60–100 lbs. of force can crack the board if it is not supported properly. A special tool is also required to remove a chip from one of these sockets. As you can imagine, even the LIF was relative, and a better solution was needed if the average person was ever going to replace his CPU.

Manufacturers began using ZIF sockets in Socket 1 designs, and all processor sockets from Socket 2 and higher have been of the ZIF design. ZIF is required for all the higher-density sockets because the insertion force would simply be too great otherwise. ZIF sockets almost eliminate the risk involved in installing or removing a processor because no insertion force is necessary to install the chip and no tool is needed to extract one. Most ZIF sockets are handle-actuated: You lift the handle, drop the chip into the socket, and then close the handle. This design makes installing or removing a processor easy.

**18** **Computer Hardware and Network Troubleshooting**

Sri Venkateshwaraa College of Engineering & Technology

**11. Describe the classification of computer. (NOV 2012)**

Classification of computers:

* MICRO-COMPUTER
* MINI-COMPUTER
* MAINFRAME COMPUTER
* SUPER-COMPUTER

**Micro computers**: These computers use a microprocessor chip and this chip is used instead of CPUmeans that this microprocessor chip works as a CPU. These computers are also called personal computers. Two major types of these computers are laptop or Desktop computers. Only one user uses these computers at time that's why they are also known as personal computers.

**Mini Computers**: Minicomputers are much smaller than mainframe computers and they are also muchless expensive. The cost of these computers can vary from a few thousand dollars to several hundred thousand dollars. They possess most of the features found on mainframe computers, but on a more limited scale. They can still have many terminals, but not as many as the mainframes. They can store a tremendous amount of information, but again usually not as much as the mainframe. Medium and small businesses typically use these computers.

**Mainframe Computer**: Mainframe computers are very large, often filling an entire room. They can storeenormous of information, can perform many tasks at the same time, can communicate with many users at the same time, and are very expensive. The price of a mainframe computer frequently runs into the millions of dollars. Mainframe computers usually have many terminals connected to them. These terminals look like small computers but they are only devices used to send and receive information from the actual computer using wires. Terminals can be located in the same room with the mainframe computer, but they can also be in different rooms, buildings, or cities. Large businesses, government agencies, and universities usually use this type of computer.

**Super Computers:** As the name "super computer" specifies that these are most powerful computers eventhan mainframe. Actually, when we optimize a mainframe computer then we get super computer.

**12. Briefly explain the terminologies for processor. (NOV 2012)**

The brain or engine of the PC is the processor (sometimes called microprocessor), or central processing unit (CPU). The CPU performs the system‘s calculating and processing. The processor is easily the most expensive single component in the system, costing up to four or more times greater than the motherboard it plugs into.

**Clock Speed**

The digital chips on a motherboard are keep in sync with each other by the clock signal (a stream of pulses) of the motherboard. Clock speed is measured in units of cycles per second, which is called a Hertz (Hz). Computer boards and CPUs run at rates of millions and billions of Hertz, megahertz (MHz) and gigahertz (GHz).

**CPU Speed**

Clock speed is only one aspect that contributes to the overall processing speed of a microprocessor. The architecture of the chip also is a factor. This includes such considerations as the word size of the chip, which is how many bits it can input/output and process at a time. Early microprocessors used 8-bit word size; the newest microprocessors use 64-bit word size. Other aspects of chip architecture that affect speed include the ability of some CPUs to work on multiple instructions at the same time.

**Data Bus**

The data bus is the multi-lane electrical highway of connections that link the CPU to the other chips on the motherboard, such as the RAM memory and I/O controllers. It is also called the front side bus (FSB). The word size of the data bus determines how many bits can be moved simultaneously along it.

**19** **Computer Hardware and Network Troubleshooting**

Sri Venkateshwaraa College of Engineering & Technology

**13. Describe in detail about the computer room preparation. (NOV 2013)**

**Influencing Factors**

**Purpose** - The purpose of a computing facility will greatly impact most design aspects including roomlayout, computer hardware, printing systems, projection/presentation systems, etc. Consider what the primary use of this facility will be:

* Open computer use - users come and go to use the computers for assignments or projects
* Instructional computing facility - facility is used for instruction lead by a single person
* Collaborative work - facility is used by students in a group project setting
* Laboratory work - computers are used for data collection or in a laboratory setting

**Specific application** - The greatest influence on the computer hardware itself is the intended applicationand operating system. These will drive the need for more powerful computers, larger monitors, specific printing needs, and other technical decisions.

**Budget** - If everyone could afford to build the perfect lab they would, but there are always budgetlimitations. Find the limits and project priorities

**Staffing/Maintenance** - A computing facility requires staffing to install, configure, and maintainhardware and software. The size, complexity, and purpose of a computing facility will determine the staffing needs. The lack of proper staffing and maintenance may limit a facilities availability or usefulness.

**Aspects for consideration**

For all of the following hardware items, one should consider the reliability, serviceability, and warranty of the specific items. This can greatly impact the maintenance costs and headaches down the road. We recommend at least a three-year warranty on all computer hardware if available.

**Workstation hardware** - This central aspect of the facility is influenced by all of the previouslymentioned factors. Consider the needs in the following areas

* CPU - What level of processing power is required by the applications?
* Memory - What amount of RAM is required by the applications?
* Primary storage space - How much storage space is required to install the local applications? Will users be storing documents on the local machines? Do applications require a great deal of swap space?
* Sub-systems - evaluate your needs for:

o Networking - generally only a 10/100 Ethernet card is required o Audio - Sound card, speakers, headphones, microphones

o Video - Video card speed and memory

o Secondary storage - CD, CD-R, DVD, Zip, etc.

* 1. Input - Keyboard and mouse variations
* Monitor - Is a large monitor needed for graphics or engineering work?
* Form factor - Is a small computer required due to furniture or space limitations? Is a small form factor monitor required for students to see the instructor or each other?

**Server hardware** - Most computing facilities rely on a server for application serving, print serving, orstorage. This hardware can vary greatly depending on the specific use of the server.

**Networking** - Networking is a core component of computing facilities; it allows access to Internetresources, access to e-mail, and the ability to collaborate remotely. Potential networking costs include installation/activation of Ethernet jacks, hubs/switches for networking within the room, and cabling. Networking may represent a good portion of the cost of the facility.

**Printing** - Most computing facilities require some form of printing to be available. For most applicationsthis simply means the ability to print black and white text documents, but there are a variety of printing needs. Another consideration is the quantity of printing expected in the facility. This greatly influences the specific model of printer within a type of printer. The following are the most popular forms of printing in campus computing facilities:

* Black and white laser printing
* Color printing (laser or inkjet)

**20** **Computer Hardware and Network Troubleshooting**

Sri Venkateshwaraa College of Engineering & Technology

* Plotting

**Other peripherals** - The purpose and specific application of a facility may require additional hardwarenot in a traditional computing lab. These are some common peripherals used in special applications:

* Scanning
* Special storage (CD-R, DVD-R, etc.)
* Special input (tablets, mapping, data acquisition, etc.)

**Audio/Video systems (projector, sound, etc.)** - Many computing facilities, especially instructional ones,benefit from the ability to display information for the entire room. This may include the ability to project computer screens, project television/video tapes/DVDs, play audio tapes/CDs, and amplify input from microphones. More advanced systems even allow instructors to project any of the workstation screens to a projector or to other computer screens on the fly.

**Upgrade path** - Any computer hardware and software will eventually have to be replaced as it becomesobsolete. Computing facilities should have an upgrade plan and budget for both hardware and software. In general, ITS uses a three-year replacement cycle for hardware in computing facilities. Software is replaced more frequently, usually as new, more useful, versions are released. Budgeting for new software is difficult due to the unpredictable nature of software development, but plan on spending about a third of your original software costs each year in upgrades.

**Furniture** - The purpose of a facility is the strongest influence on the furniture and layout of the facility.An open computer lab may simply be rows of computers on basic tables. An instructional facility may have rows all facing the front of the room for instruction. A collaborative facility may have single computers (or groups of computers) at large tables designed to seat many students. At least one workstation in each facility should be placed on an adjustable height table for accessibility by people using wheelchairs. In an instructional facility, the instructors workstation should also be placed on an adjustable height table.

**Accessibility** - In addition to placing accessible tables in the lab, one should also consider theaccessibility of the computer applications(using special input/output hardware or software), other systems (printing, A/V equipment, etc.), and the accessibility of the room layout.

**Power** - Often the existing power circuit(s) in a room are not sufficient for a computing facility. Examineyour power needs and resources, and contact facilities management regarding power system upgrades.

**14. Describe the DMA Architecture of the PC in detail? (NOV 2010)**

**Direct memory access** (**DMA**) is a feature of computerized systems that allows certain hardwaresubsystems to access main system  [memory](http://en.wikipedia.org/wiki/Computer_storage) independently of the  [central processing unit](http://en.wikipedia.org/wiki/Central_processing_unit) (CPU).



**DMA Architecture**

**21** **Computer Hardware and Network Troubleshooting**

Sri Venkateshwaraa College of Engineering & Technology

Without DMA, when the CPU is using  [programmed input/output,](http://en.wikipedia.org/wiki/Programmed_input/output) it is typically fully occupied for the entire duration of the read or write operation, and is thus unavailable to perform other work. With DMA, the CPU first initiates the transfer, then it does other operations while the transfer is in progress, and it finally receives an  [interrupt](http://en.wikipedia.org/wiki/Interrupt) from the DMA controller when the operation is done. This feature is useful at any time that the CPU cannot keep up with the rate of data transfer, or when the CPU needs to perform useful work while waiting for a relatively slow I/O data transfer. Many hardware systems use DMA, including disk drive controllers, graphics cards, network cards and sound cards. DMA is also used for intra-chip data transfer in multi-core processors. Computers that have DMA channels can transfer data to and from devices with much less CPU overhead than computers without DMA channels. Similarly, a processing element inside a multi-core processor can transfer data to and from its local memory without occupying its processor time, allowing computation and data transfer to proceed in parallel.

DMA can also be used for "memory to memory" copying or moving of data within memory. DMA can offload expensive memory operations, such as large copies or  [scatter-gather](http://en.wikipedia.org/wiki/Vectored_I/O) operations, from the CPU to a dedicated DMA engine. An implementation example is the  [I/O Acceleration Technology](http://en.wikipedia.org/wiki/I/O_Acceleration_Technology).

A DMA controller can generate  [memory addresses](http://en.wikipedia.org/wiki/Memory_address) and initiate memory read or write cycles. It contains several  [processor registers](http://en.wikipedia.org/wiki/Processor_register) that can be written and read by the CPU. These include a memory address register, a byte count register, and one or more control registers. The control registers specify the I/O port to use, the direction of the transfer (reading from the I/O device or writing to the I/O device), the transfer unit (byte at a time or word at a time), and the number of bytes to transfer in one burst. [[1](http://en.wikipedia.org/wiki/Direct_memory_access#cite_note-Osborne80-1)]

To carry out an input, output or memory-to-memory operation, the host processor initializes the DMA controller with a count of the number of  [words](http://en.wikipedia.org/wiki/Word_%28computer_architecture%29) to transfer, and the memory address to use. The CPU then sends commands to a peripheral device to initiate transfer of data. The DMA controller then provides addresses and read/write control lines to the system memory. Each time a byte of data is ready to be transferred between the peripheral device and memory, the DMA controller increments its internal address register until the full block of data is transferred.

DMA transfers can either occur one byte at a time or all at once in burst mode. If they occur a byte at a time, this can allow the CPU to access memory on alternate bus cycles – this is called  [cycle stealing](http://en.wikipedia.org/wiki/Cycle_stealing) since the DMA controller and CPU contend for memory access. In *burst mode DMA*, the CPU can be put on hold while the DMA transfer occurs and a full block of possibly hundreds or thousands of bytes can be moved. [[2]](http://en.wikipedia.org/wiki/Direct_memory_access#cite_note-Art89-2) When memory cycles are much faster than processor cycles, an *interleaved* DMA cycle is possible, where the DMA controller uses memory while the CPU cannot.

In a  [bus mastering](http://en.wikipedia.org/wiki/Bus_mastering) system, the CPU and peripherals can each be granted control of the memory bus. Where a peripheral can become bus master, it can directly write to system memory without involvement of the CPU, providing memory address and control signals as required. Some measure must be provided to put the processor into a hold condition so that bus contention does not occur.

**15. Explain in detail about computer mnemonics. (APR 2012)**

In general, a mnemonic (from Greek *mnemon* or mindful) is a memory aid, such as an abbreviation, rhyme or mental image that helps to remember something. The technique of developing these remembering devices is called "mnemonics." Mnemonics can be used to remember phone numbers, all your new department colleagues' names or the years of the reigns of the Kings and Queens of England. A number of approaches are used.

A mnemonic is a term, symbol or name used to define or specify a computing function. Mnemonics are used in computing to provide users with a means to quickly access a function, service or process, bypassing the actual more lengthy method used to perform or achieve it. Assembly language also uses a mnemonic to represent machine operation, or opcode.

**22** **Computer Hardware and Network Troubleshooting**

Sri Venkateshwaraa College of Engineering & Technology

In computer programming, routine programming functions are assigned a mnemonic that is shorter in length but provides the same functionality as the original function. In assembly language, mnemonics are used to specify an opcode that represents a complete and operational machine language instruction. This is later translated by the assembler to generate the object code. For example, the mnemonic MOV is used in assembly language for copying and moving data between registers and memory locations.

**Pondicherry University Questions**

**PARTA (2 Marks)**

1. What is processor? (NOV 2013)
2. Define system clock? (NOV 2013)
3. What are the two types of hardware interrupts (NOV 2010)
4. List the type of switching logic control in SMPS? (NOV 2010)
5. What is BIOS? (APR 2011), (NOV 2012)
6. List any four components of Mother Board? (APR 2011)
7. Expand SMPS, DMA? (APR 2012)
8. What are the types of memory? (APR 2012)
9. List out the Hardware components of PC? (NOV 2012)
10. Define computer? (NOV 2012)
11. What is meant by cache memory? (NOV 2012)
12. Why is the maximum value in decimal that can be represented by an eight bit binary number?( NOV 2014)
13. If the number of bits in MAR is 10, What is the maximum memory capacity? (NOV 2014)

**PART B (11 Marks)**

1. Explain briefly about History of the PC. (Ref.Pg.No.6,Qn.No.1)
2. Draw the functional Block diagram of the PC and explain its parts (APR 2011) (Ref.Pg.No.8,Qn.No.2)
3. Explain briefly about data flow inside the PC. (Ref.Pg.No.11,Qn.No.3)
4. Explain briefly about Microprocessor Types and Specifications (NOV 2013) (NOV 2014). (Ref.Pg.No.12,Qn.No.4,5,6)
5. What is Cache memory? Explain in detail. (Ref.Pg.No.13,Qn.No.7)
6. Explain the features of Processors. (NOV 2014) (Ref.Pg.No.14,Qn.No.8)
7. Explain the Following : a) System Management Mode b) Super Scalar Execution c) Dynamic Execution d) Dual Independent Bus (DIB) e) Hyper-Threading

f) Dual and Multi-Core Technology. (Ref.Pg.No.14,Qn.No.9)

1. Explain with neat diagram socket and slot types of Intel‘s Pentium and core processors and AMD K6 to K8 processors. (Ref.Pg.No.17,Qn.No.10)
2. Describe the classification of computer? (NOV 2012) (Ref.Pg.No.19,Qn.No.11)
3. Briefly explain the terminologies of the processor (NOV 2012) (Ref.Pg.No.19,Qn.No.12)
4. Describe in detail about computer room preparation (NOV 2013) (Ref.Pg.No.20,Qn.No.13).
5. Describe the DMA Architecture of the PC in detail? (NOV 2010) (Ref.Pg.No.21,Qn.No.14)
6. Explain in detail about computer mnemonics. (APR 2012) (Ref.Pg.No.22,Qn.No.15)

**23** **Computer Hardware and Network Troubleshooting**