UNIT – 01

PC Components and System Board

Syllabus:

Hardware used for I/P, O/P & inside computer case, system board components used for communication among devices, Software - 3 types of Software, ROM BIOS, OS, application software, Functions of BIOS, The boot process, POST and important beep codes, Know about different connectors, Types of system boards, The CPU & the chipset – CPU form factor, CPU slots and sockets, Different types of RAM, Buses – ISA, MCA, EISA, USB, Firewire, AGP,PCI, Setting the CPU & Bus speeds, CMOS setup and data protection.

1) What is hardware and software ? (This Topic cover "Hardware used for I/P, O/P & inside computer case, system board components used for communication among devices")

Hardware is the physical components of the computer. Hardware components are visible.

EX: Circuit boards, processor, floppy drive etc.

Computer without software is like a car without driver.

Software is often divided into two categories:

- **System software:** includes the operating system and all the utilities that enable the computer to function. The purpose of the system software is to improve the performance o the system.

- **Application software:** the software designed for a specific application is application software. The programs we develop come under this category. For example, word processors, spread sheets and data base management systems fall under the category of applications software.

2) What is Difference between hardware and software?

There are several differences between computer hardware and software. However, the fundamental difference between hardware and software is that hardware is a physical device something that you're able to touch and see. For example, the computer monitor or the mouse you're using to navigate is considered computer hardware.

Software is code and instructions that tell a computer and/or hardware how to operate. This code can be viewed and executed using a computer or other hardware device. However, without any hardware software would not exist. An example of software is Microsoft Windows, an operating system that allows you to control your computer and other programs that run on it. Another example of software is the Internet browser.

3) What is Firmware?

Software (programs or data) that has been written onto read-only memory (ROM). ROMs, PROMs and EPROMs that have data or programs recorded on them are firmware.

4) What are the HARDWARE USED FOR INPUT AND OUTPUT?

A computer cannot sense the outside world. To communicate with outside world it needs some devices which are known as peripherals.

An input peripheral device accepts input from the user and feeds into the computer.

EX: Keyboard, light pen, mouse, joystick, track ball etc.

An output peripheral device takes information for the computer and displays or prints the information to the user.

EX: Printers, monitors, plotters.

INPUT PERIPHERALS:

Keyboard: A keyboard is most widely used input device to type information.

Mouse: A mouse is pointing device which used to locate any point on the screen.

Joystick: A joystick is am input device that is used to move the cursor or other objects in the screen. It is generally used in video games.

Light Pen: light pen consists of a pen like device and photo electric cell. Light pen is used to draw pictures on the screen.

Touch screen: Touch screen is an input peripheral device. By using touch screen we can issue to the computer by touching the screen. You can see touch screen systems in major railway stations.

Scanner: A scanner is an input device that transfers images or texts form a piece of paper into a computer.

Digitizer: It is an input device. It transforms the graphical representation of a picture into digital representation. Digitizer is also known as graphics tablet. It consists of a flat surface like a drawing pad and a reading device which may be stylus or a pen. A push button cursor or puck. Digitizer is very useful in CAD applications

OUTPUT PERIPHEALS:

Output peripherals can be classified into 2 types:

(a) Hardcopy output devices

(b) Softcopy output devices

Hardcopy output devices: The output produced by these devices can be stored.

EX: Printer and plotters

Softcopy output devices: The output produced by these devices is temporary.

EX: Monitor.

Printers are used to print graphics or text on paper.

Plotters are output device similar to printers and are used to produce high quality drawing in engineering applications. Printers cannot produce such types of drawing properly.

Monitor is the output peripheral device.

5) What are the HARDWARE inside computer case?

Most computers contain the following devices inside the case:

- A motherboard or system board containing the CPU, memory and other components.

- A floppy drive, hard drive and CD-ROM drive used for permanent storage.

- A power supply with power cables supplying electricity to all devices inside the case. This power supply is known as SWITCH MODE POWER SUPPLY (SMPS).

- Circuit boards used by the CPU to communicate with devices inside and outside the case.

- Cables connecting devices to circuit boards and the mother board.

- Cooling fans.

SYSTEM BOARD COMPONENTS USED FOR COMMUNICATION AMONG DEVICES:

To connect various devices to the system, motherboard provides expansion slots. The type of expansion slots available on the motherboard depends upon the systems bus architecture.

With reference to PCs, a bus is a pathway on the motherboard that enables components to communicate with the CPU.

Common buses include Industry Standard Architecture (ISA), Peripheral Common Interconnect (PCI), and Accelerated Graphics Port (AGP). Collectively these are referred to as the motherboard expansion bus.

Peripheral Component Interconnect (PCI): Expansion slot used for high speed input/output devices.

Industry Standard Architecture (ISA): Expansion slot used by older and/or slower devices.

Accelerated Graphics Port (AGP): Expansion slot used for video card.

Note:

You can easily identify these slots by their colors.

ISI black

PCI white

AGP Light Brown

An **expansion card** in computing is a printed circuit board that can be inserted into an expansion slot of a computer mother board to add additional functionality to a computer system. One edges of the expansion card holds the contacts that fit exactly into the slot. They establish the electrical contact between the electronics (mostly integrated circuits) on the vard and on the mother board.

These cards are also known as interface cards, circuit cards, adapter boards or daughter boards.

6) What are the 3- types of software?

Software consists of programs written by programmers that instruct computers to perform specific tasks. All most all PC software falls into three categories.

- Firmware(BIOS)
- Operating System(OS)
- Application Software

BIOS perform the following three important useful functions of PC.

- It boots the computer
- It validates the PC's configuration
- It provides an interaction between hardware of the PC and its software.

OPERATING SYSTEM: Can be defined as system software which acts as interface between user and the system and manages the resources in efficient way. The primary goal of an operating

system is thus to make the computer system easy to use. Secondary goal is hardware resource management.

The operating system is the most basic program in a computer. All computers have an operating system that is used for starting the computer and running other programs (application programs). The operating system performs inportant tasks like receiving input form the keyboard and mouse, sending information to the screen, keeping track of files and directories on the disk, as well as controlling the various units such as disk printers etc.

APPLICATION PROGRAMS: Are developed for a particular application. For example payroll package is developed to calculate salary details of employees of an organization. Application programs will be written by users. Let us assume that you are writing a C program, the compiler you are using to run this program is an example for system software. The C program which you have prepared is an example for application program.

7) What are the Function of Bios?

BIOS acronym for Basic Input/output System, the built-in SOFTWARE that determines what a computer can do without accessing programs from a disk.

When you first turn on your PC, the processor is "ready to go", but it needs some instructions to execute. However, since you just turned on the machine, your system memory is empty; there are no programs to run. To make sure that the BIOS program is always available to the processor, even when it is first turned on, it is "hard-wired" into a read-only-memory (ROM) chip that is placed on your MOTHER BOARD.

A uniform standard was created between the makers of processors and the makers of BIOS programs, so that the processor would always look in the same place in memory to find the start of the BIOS program. The processor would always look in the same place in memory to find the start of the BIOS program. The processor gets its first instructions from this location, and the BIOS program begins executing. The BIOS program the begins the system boot sequence which falls other

programs, gets your operating system loaded, and your PC up and running.

The BIOS program is always located in a special reserved memory area; the upper 64k of the first megabyte of system memory (addresses F000h to FFFFh). Some BIOSes use more than this 64k area.

One other function of the BIOS is to give instructions for the power-on self test (POST). This self test ensures that the computer has all of the necessary parts and functionally needed to successfully start itself, such as use of memory, a keyboard and other parts.

The primary function of the BIOS is to load and start an operating system. When the PC starts up, the first job for the BIOS is to initialize and identify system devices such as the video display card, keyboard and mouse, hard disk, CD/DVD drive and other hardware. The BIOS then locates software held on a peripheral device (designated as a 'boot device'), such as a hard disk or a CD, and loads and executes that software giving it control of the PC this process is known as booting or booting up, which is short for bootstrapping.

A BIOS will also have a user interface. Typically this is a menu system accessed by pressing a certain key on the keyboard. When the PC starts. In the BIOS user interface, a user can:

- Configure hardware
- Set the system clock
- Enable or disable system components
- Select which devices are eligible to be a potential boot device\
- Set various password prompts, such as a password for securing access to the BIOS User interface functions itself and preventing malicious users form booting the system from unauthorized peripheral devices.

The BIOS provides a small library of basic input/output functions used to operate and control the peripherals such as the keyboard, text display functions and so forth and these software library functions are callable by external software.

8) What is the boot process?

The process used to start up a PC each time it is powered on is called the **Boot process.** The boot process is performed under the guidance of the BIOS. The BIOS contains the instruction needed to verify, test and start the PC.

The following functions performed during boot process:

- The first step is to check whether the initial program load hardware, the minimum hardware that should be working properly, is working.
- The BIOS next runs the Power On Self Test routines. The POST verifies and tests the hardware configuration stored in the BIOS configuration information. If there is problem with Hardware BIOS sound beep codes to indicate the nature of the problem or displays an error message.
- After all the successful completion of the tests, the bootstrap program is executed.
- Boot strap program loads the operating system.
- Once the operating system is loaded, it takes the complete control of the functioning of the computer system and is now ready to execute users instructions.

Booting is of three types:

- **Hard Boot (Cold Boot):** This boot sequence is taken palce when PC is poweredon from off position.

With this bootong all the above sequence steps will take place.

- **Soft Boot (Warm Boot):** This booting takes place when the PC is already powered on and pressing key combinations like

Ctrl+Alt+Del or pressing reset button. In this booting POST process does not run.

- **Random Boot:** This type of booting takes palce without knowledge of the user. It may take place because of malfunctioning of either hardware or software.

9) What is the post and the important beep code?

The POST (Power On Self Test) is a collection of test programs. The function of these programs is testing the various funactional units in the PC and verifying whether they are working or not. The POST programs are automatically executed whenever the PC is turned on or reset.

If the computer passes the POST the computer will have a single beep as the computer starts and the computer will continue to start normally. However, if the computer fails the POST, the computer will either not beep at all or will generate a beep code, which tells the user the source of the problem.

The steps of a POST:

Each time the computer boots up the computer must past the POST. Below is the common steps a POST performs each time your computer starts.

1. Test the power supply to ensure that is turned on and that it releases its reset signal.

2. CPU must exit the reset status mode and there after be able to execute instructions.

3. BIOS checksum must be valid, meaning that it must be readable.

4. CMOS checksum must be valid, meaning that it must be readavle.

5. CPU must be able to read all forms of memory such as the memory controller, memory bus and memory module.

6. The first 64KB of memory must be operational and have the capability to be read and written to and from, and capable of containing the POST code.

7. I/O bus/controller must be accessible.

8. I/O bus must be able to write/read from the video subsystem and be able to read all video RAM.

If the computer does not pass any of the above tests, your computer will receive an irregular POST is a beep code that is different from the standard one or two beeps. This could be either no beeps at all or a combination of different beeps indicating what is causing the computer not to past the POST.

1 short beep	Normal post –system is ok
2 short beeps	Post error –error code shown on screen
3 no beep	Power supply or system board problem
Continous beep	Power supply, system board or keyboard problem
Repeating short beeps	Power supply or system board problem
1 long, 1 short beep	System board problem
1 long. 2 short beeps	Display adapter problem (MDA, CGA)
1 long, 3 short beeps	Enhanced Graphics Adapter (EGA)
3 long beeps	3270 keyboard card
100-199	System board
200-299	Memory
300-399	Keyboard
400-499	Monochrome display
500-599	Color/ graphics display
600-699	Floppy-disk drive and/or adapter
700-799	Math coprocessor
900-999	Parallel printer port
1000-1099	Alternate printer adapter
1100-1299	Asynchronus communixcation device, adapter or port
1300-1399	Game port
1400-1499	V=color/ graphics printer
1500-1599	Synchronus communication device,adapter or port
1700-1799	Hard drive and/or adapter
1800-1899	Expansion unit (xt)
2000-2199	Bisynchronous communication adapter
2400-2599	EGA system-board video (MCA)
3000-3199	Lan adapter
4800-4999	Internal modem

7000-7099	Pheonix BIOS chips
7300-7399	3.5” disk srive
8900-8999	MIDI adapter
11200-11299	SCSI adapter
21000-21099	SCSI fixed disk and controller
21500-21599	SCSI CD-ROM system

10) What are the different connectors?

Connectors, normally called “**input-output connectors”** (or I/O for short), are interfaces for linking devices by using cables. They generally have a male and with pins protruding from it. This plug is meant to be inserted into a female part (also called a **Socket**), which includes holes for accommodating the pins. However, there are plugs which can act as either male or female plugs, and can be inserted into either one.

The computer’s motherboard has a certain number of input-output connectors located on the “rear panel”.

Most motherboards have the following connectors:

- Serial port, which uses a DB9 connector, for connecting older devices;
- Parallel port, which uses a DB25 connector, mainly for connecting old printers;
- USB ports(1.1, low-speed, or 2.0 nhigh-speed), for connecting more recent peripherals;
- RJ45 connector (called LAN port or Ethernet port), for connecting the computer to a network. It interface with a network card built into the motherboard;
- VGAconnector (called SUB-D15), used for looking up a monitor. This connector interfaces eith the built-in graphics card;

- Jacks (Line-IN, Line-Out and Microphone), for connecting speakers or a hi-fi sound system, as well as a microphone. This connector interfaces with the built-in sound card

11) What is the system board?

A **Mother Board**, also known as a **Main Board, System Board** or **Logic Boards** is the central primary circuit board making up a complex electronic system, such as a modern computer. Mother board is the most important component of the computer. Mother board ties all the components of the computers.

CPU, System clock,ROM BIOS, CMOS configuration chip and its battery, RAM, System bus with expansion card slots, jumper and DIP switches, ports, power supply connections.

A typical computer is built with the micro processor, main memory and other basic components on the motherboard.

Other components of the computer such as external storage , control circuits for video display and sound and peripheral devices are typically attached to the motherboard.

In the initial days of computing was built in a case or Mainframe with a series of wired together connectors called a **back plane** into which the CPU, memory and I/O on separate card was plugged. With the arrival of the microprocessor, it became more cost-effective to place the back plane connectors, processor and logic onto a single "Mother board", and have the video, memory and I/O on "Child cards" –hence the terms 'Mother board' and Daughter board.

11) What are the types of system board?

A system boards primary purpose is to house the CPU and allow all devices to communicate with each other. The two most popular system boards are the older AT and newer ATX. The AT system board has a power connection for 5 and 12 volt lines coming from the power supply. To accommodate the newer CPUs that use less voltage the ATX has lines for 5,12 and 3.3 volts from the power supply.

Each board is available in to sizes. The ATX board include more power management features and support faster system. Following table summarizes different boards and their form factors. The **form factor** of the mother board describes its general shape, what sorts of cases and power supplies it can use, and its physical organization. For example,a company

can make two mother boards that have basically the sam e functionality but that usea different form factor, and the only real differences will be the physical layout o fthe board, the position of the components, etc.

Type of system board	Description
AT	• Oldest type of system board. • Uses P8 and P9 power connections • Measures 30.5 cm x 33 cm
Baby AT	• Smaller version at AT. Small size is possible because system board logic is stored on a smaller chip set • Uses P8 and P9 power connections • Measures 33 cm x 24.4 cm
ATX	Developed by Intel for Pentium systems. More conveniently accessible layout. Uses a single 20 pin power connector Measures 30.5 cm x 24.4 cm
Mini ATX	An ATX board with a more compact design. Measures 28.4 x 20.8

SYSTEM BOARD IS FURTHER DIVIDED INTO THREE PARTS:-

1) CPU AND CHIPSET

2) CPU FORM FACTORS

3) CPU SLOTS AND SOCKETS

1) CPU AND CHIPSET:-

CPU is the brain cum heart of the computer. Data is processed here. It takes information from the input unit and processes it according to the instructions. The instructions are given by programs. Programs are written in the language which computer can understand. Data processing does any of the following.

- Making arithmetic calculations like addition, subtraction, multiplication, division and exponentiation etc.

- Making logical decisions like comparing two values to find out which one is greater

- Manipulating alphabetic or alphanumeric data like word processing, letter writing, sorting in alphabetic or alphanumeric orders, editing etc.

- Converting data from one from to another.

- Communicating data to other systems.

- Storing the data temporarily and retrieving it as and when required.

Basically the CPU does everything in binary language i.e, with the help of 0 and 1.

Chipset: The chipset is a group of chips that helps the processor and other components on the PC communicate with and control all the devices plugged into the motherboard. The chipset contains only the instructions to perform its functions. The chipset controls the bits that flow between the CPU, system memory and over the motherboard's bus. The chipset also manages data transfers data transfers between the CPU, memory and peripheral devices and provides support for the expansion bus and any power management features of the system.

The Intel Chipset: The characteristic that differs one chipset from another is whether it has one, two or more chips in the set. The two chip chipset, which contains what is called north bridge and the south bridge.

The north bridge is the major bus circuitry that provides support and control for the main memory, cache memory and the PCI bus controller.

The south bridge includes the controllers for the peripheral devices.

2) CPU FORM FACTORS:

The form factor of the CPU describes its general shape, what sorts of Sockets and slots used and how heat sink is arranged, and its physical organization.

The following five form factors are used by Intel.

S.E.P Form Factor	Single edge processor. The processor is not completely covered by the black plastic housing, making the circuit board visible at the bottom

S.E.C.C Form Factor	Single edge conact catridge the processor is completely covered with black plastic housing and a heat sink and fan are attached to the housing.
S.E.C.C.2 Form Factor	Like the S.E.C.C form factor, boxed processors in the S.E.C.C.2 form factor have a plastic housing with active heat sink and fan. The most noticeable difference is that the contacts are exposed on the S.E.C.C.2 form factor factor as shown in this photo.
PPGA Form Factor	Plastic pin grid array Intel Celeron processors are still available in the PPGA form factor. With this package, the CPU's silicon core faces down, toward the socket.
PPGA Form Factor	The FC-PGA (Flip Chip-Pin Grid Array) form factor is a chip packaging designed for Intel Pentium III processes and new Celeron CPUs. On the FC-PGA package, the processor's silicon core faces up, and is exposed. This allows the core to have direct contact with a heat sink.

3) CPU SLOTS AND SOCKETS

Slot or socket is the physical connection used to connect a device (CPU) to the system board. The type of slot or socket supplied by the system board for the processor must match that required by the processor.

This is a socket from a Pentium 4 board. These CPU's are fairly easy to install. You basically just drop the CPU into the socket lock it with the locking arm. Then all you have left is to install the cooler and set up the clock speed.

This is a slot 1 made for Pentium II, early Pentium III and early Celeron CPUs. It looks a lot like an expansion slot, but is not generally located in the same area on the board. Also once you get the CPU into it with all the cooling it is much bulkier then what you would usually see in any expansion slot.

Following table shows various CPU sockets and slots.

CONNECTOR NAME	USED BY CPU
Socket 4	Classic Pentium 60/66
Socket 5	Classic Pentium 75/90/100/120
Socket 6	Not used
Socket 7	Pentium MMX, Fast Classic Pentium AMD k5, AMD k6, Cyrix M

Socket 8	Pentium Pro
Socket 370 or	Pentium III FC-PGA PGA 370 Socket Celeron PPGA, Cyrix III
Slot 1 or SC242	Pentium II, Pentium III
Slot A	AMD Athalon
Slot 2 or SC330	Pentium II Xeon, Pentium III Xeon

12) What is the different type of Ram?

RAM stands for **Random Access Memory.** RAM is the place where your computer temporarily stores its operating system, application programs and current data, so that the computer's processor can reach them quickly and easily. When refer to computer's memory, they mostly it means RAM, and it is volatile. Volatile means that when you turn off your computer, anything in RAM disappears or is erased.

Desktop computers usually come with 16 or more **Megabytes** of RAM, usually increasing in multiples of 8 megabytes. If you use graphic applications, you probably have 32, 64 or more megabytes of memory. Most personal computers are designed so that you can add more RAM modules up to the limit imposed by the motherboard.

If you add more RAM to your computer, you reduce the number of times your processor must read data from your hard disk (Virtual Memory). This usually allows your computer to work considerably faster.

Again, RAM is volatile. It requires a steady flow of electricity to maintain its contents, so data stored in RAM stays there only as long as your computer is running. As soon as you turn the computer off, you lose everything that was in RAM.

When you turn you computer on again, your computer's boot firmware (called a BIOS on a PC) uses instructions stored semi-permanently in ROM chips to read your operating system and related files from the disk and load them back into RAM. On a Personal Computer, different parts of RAM may be more or less easily accessible to programs.

Main memory- SIMM, DIMM other RAM technologies.

Primary Storage, or Internal Memory, is computer memory that is accessible to the central processing unit of a computer without the use of computer's i/o channels. Primary storage is used is typically very fast, as in the case of RAM.

SIMM:

In earlier PCs, main memory was stored on the system board as single, socketed chips, but today RAM is coming in SIMM(Single Inline Memory Module) or the DIMM(Dual Inline Memory Module) which will be inserted directly into the system board. The major difference between SIMM and DIMM is – the width of the data path. A SIMM has a data path of 32 bits, and DIMM has a data of 64 bits.

SIMM used first FPM and EDO technologies and DIMM using burst EDO then SDRAM and then Direct Ram bus technology. The goal of these technologies is to increase overall throughput.

FPM(Fast Page Mode) improved on the earlier memory types by sending the row address just once for many access to memory near that row address just once for many access to memory near that row. Earlier memory types required a complete row and column address for each memory access.

EDO(extended data out) is an improvement over FPM memory. It is faster because it allows the memory controller to eliminate the 10-ns delay while it waited before it issuing the next memory address.

DIMM Technologies:

A **DIMM**, or **Dual Inline Memory Module** comprises a series of random access memory integrated circuits. These modules are mounted on a printed circuit board and designed for use in personal computers. DIMMs began to replace SIMMs.

The first DIMMs used EDO or Burst EDO and then used synchronus RAM(SDRAM).

BEDO is reined version of EDO with improved access time over EDO. BEDO is not widely used because intel chose not to support it.

Synchronous DRAM is currently the most popular memory type. SDRAM operates in synchronous with system clock where as others all run at a same speed.

SDRAM is in 3 variations:

- ❖ Regular SDRAM
- ❖ SDRAM II
- ❖ SYNCLINK(SLDRAM)

  Regular SDRAM runs at the same speed as the system bus SDRAM data path is 64 bit wide.

Double data rate SDRAM(DDR SDRAM) sometimes called SDRAM II, runs twice fast as regular SDRAM. Instead of processing data for each pulse of the system clock as regular SDRAM does, it process data when pulse raises and again when it falls doubling the data when pulse raises raises and again when it falls doubling the data rate of memory.

SYNCLINK(SLDRAM) it improved on regular SDRAM by increasing the number of memory banks that can be accessed simultaneously from four to sixteen.

Other important variety of RAM is **Direct RAMBUS** RAM or **RDRAM.** It used the following principle "Narrow the data pathe and improve the rate of speed of data." The data path is 16 bits with this narrow data path they managed speeds of 400 MHz to 800 MHz. So, design concept is totally different from others.

13) What are the different types of Bus?

In computers, the **front side bus (FSB) or system bus** is a term for the physical bi-directional data bus that carries all electronic signal information between the central processing unit (CPU) and other devices within the system such as random access memory (RAM), AGP video cards , PCI expansion cards, hard disks, the memory containing the system BIOS, etc.

The bus is a series of interconnecting electrical leads which carry signals. The bus design can further be broken down into bus sections.

The **internal bus (main bus, processor bus) section** connects all the internal computer components of the CPU and main memory. This is called the Local Bus or Front side Bus**.**

- The **system bus** or **backside bus** section connects the CPU to the CPU's L2 cache.

- The **external bus** or **i/o bus (host bus)** section enables expansion boards to access the CPU and memory.

All buses have:

- **Size:** known as width in bits. **Ex:** 8-bit, 18-bit, 32-bit, or 64-bit data path.

- **Clock Speeds:** measured in MHz (different from CPU clock speed). 66 MHz and 100 bus speeds are common today.

- **Location**
    - On the printed integrated circuit of the mother board
    - On adapter/expansion cards.
    - In some connectors, such as, the SCSI bus.
- And transfers data through either]
    - DMA (Direct Memory Address) Addressing.
    - Bus Mastering.

ISA:

The most common bus in the PC world, ISA stands for Industry Standard Architecture. The ISA bus is still in use even in the newest computers, despite the fact that it is largely changed since it was expanded to 16 bits in 1984.

The original ISA bus on the IBM PC was 8 bits wide, reflecting the 8 bit data width of the Intel 8088 processor's system bus, and ran at 4.77 MHz, the speed of the first 8088s. In 1984 the IBM AT was introduced using the Intel 80286; at this time the bus was doubled to 16 bits (the 80286's data bus width) and increased to 8 MHz .So this bus is also known as AT BUS.

Micro Channel Architecture (MCA) Bus:

The MCA bus (also called the Micro Channel bus; MCA stands for "Micro Channel Architecture") was IBM's attempt to replace the ISA bus with something "bigger and better". When the 80386DX was introduced in the mid-80s with its 32-bit data bus, IBM decided to create a bus to match this width. MCA is 32 bits wide, and offers several significant improvements over ISA. IBM wants to patent this bus so that other manufacturers cannot make this bus. Then COMPAQ and other companies developed EISA bus.

Extended Industry Standard Architecture (EISA): EISA stands for Extended Industry Standard Architecture. EISA developed by Compaq as answer to IBM's MCA bus, and followed a similar path of development — with very similar results.

Some of the Key Features of the EISA Bus:

• ISA Compatibility: ISA cards will work in EISA slots.

• 32 Bit Bus Width: Like MCA, the bus was expanded to 32 bits.

• Plug and Play: EISA automatically configures adapter cards, similar to the Plug and Play standards of modern systems.

The EISA bus is not popular on desktop systems for several reasons. First, EISA-based systems tend to be much more expensive than other types of systems. Second, there are few EISA-based cards available.

USB:

Now a days, if you buy any computer it will come with **Universal Serial Bus** connectors on the back. These USB connectors let you attach everything from mice to printers to your computer quickly and easily. The operating system supports USB as well, so the installation of the device drivers is quick and easy, too.

Compared to other ways of connecting devices to your computer (including parallel ports, serial ports and special cards that you install inside the computer's case), USB devices are incredibly simple!

USB Connector:

The Universal Serial Bus gives you a single, standardized, easy- to-use way to connect up to **127 devices** to a computer. A USB host controller manages the USB bus.

A sample list of USB devices that you can buy today includes:

• Printers

• Scanners

• Mice

• Joysticks

• Flight yokes

• Digital cameras

• Webcams

• Scientific data acquisition devices

• Modems

• Speakers

• Telephones

• Video phones

• Storage devices such as Zip drives

• Network connections

The devices connected to a USB port rely on the USB cable to carry power and data.

Inside a USB cable: There are two wires for power - +5 volts (red) and ground (brown) — and a twisted pair (yellow and blue) of wires to carry the data. The cable is also shielded.

Fire wire or i.Link or 1394:

FireWire is a method of transferring information between digital devices, especially audio and video equipment. Also known as IEEE 1394, FireWire is fast — the latest version achieves speeds up to 800 Mbps. At some time in the future, that number is expected to jump to an unbelievable 3.2 Gbps when manufacturers overhaul the current FireWire cables.

You can connect up to 63 devices to a Fire Wire bus. Windows operating systems (98 and later) and Mac 05 (8.6 and later) both support it.

The key difference between FireWire and USB is that FireWire is intended for devices working with a lot more data — things like camcorders, DVD players and digital audio equipment.

Local I/O BUS: The primary purpose of the local bus is to provide direct access to the CPU for a few fast devices such as memory and video that can run at nearly the same speed as the CPU. A local I/O bus must connect to the CPU by way of the memory bus. Following Fig shows an example of a local bus that uses a 32 bit expansion slot created by adding an extra slot to a 16 bit ISA slot.

PERIPHERAL COMPONENT INTERCONNECT (PCI)

The Peripheral Component Interconnect, or PCI Standard

(in practice almost always shortened to PCI) specifies a computer

bus for attaching peripheral devices to a computer motherboard:

These devices can take any one of the following forms:

• An integrated circuit fitted onto the motherboard itself, called a planar device in the PCI specification.

• An expansion card that fits in sockets.

The PCI bus is common in modern PCs, where it has displaced ISA and VESA Local Bus as the standard expansion bus. The bus will eventually be succeeded by PCI Express, which is standard in most new computers, and other technologies.

The PCI specification covers the physical size of the bus (including wire spacing), electrical characteristics, bus timing, and protocols.

The advantage of PCI local bus is that devices connected to it can run at one speed, while CPU runs at different speed.

AGP:

The **Accelerated Graphics Port** (also called Advanced Graphics Port) is a high-speed point-to-point channel for attaching a graphics card to a computer's motherboard, primarily to assist in the acceleration of 3D computer graphics. Some motherboards have been built with multiple independent AGP slots. AGP has almost completely been phased out in favor of PCI Express.

13) How is the CMOS setup & data protected?

Computers today store most configuration information on one CMOS chip that retains the data even when the computer is turned off. A battery near the CMOS chip provides enough electricity to enable the chip to maintain its data. If the battery is disconnected or fails, setup information is lost. Password information is also a part of the computer's setup that is stored in CMOS.

Following table shows some important CMOS settings and their purpose:

Category	Setting	Description
Standard	Date and time	Used to set system date and time
CMOS setup	Primary display	Used to tell type of video being used
	Hard disk type	
	Floppy disk drive	Used to record size

		and mapping of the drive. Choices are usually 31/2 inch and 51/4 inch.
Advanced CMOS setup	System boot sequence External cache memory Password checking option Boot sector virus protection	Uses to establish the drive the system first checks for an OS. Uses to enable L2 cache. Uses to establish a setup password Gives warning when something is being written to the boot sector of the hard drive.
Power menu	Power management HOD power down	Disable or enable all power managementFeatures. These features are designed to save Electricity. Disable or enable the feature to shut down the hard drive after a period of time.

DATA PROTECTION:

• Backup your data files and test your backups

• Never share your passwords with others. If you suspect someone knows your passwords, change it immediately!

• Use Strong passwords

• Lock your computer when unattended

. Power off your computer at the end of the day

• **Use Firewalls:** Firewalls should be used on any computer that connects to a network or the Internet. Computer hardware and/or software that limits access to a computer over a network or from an outside source

• **Use Anti-Spy Ware Programs:** Any software that gathers user information through the user's Internet connection without his or her knowledge, usually for advertising purposes. Spyware applications are typically bundled as a hidden component of freeware or shareware programs that can be downloaded from the Internet. Once installed, the spyware monitors user activity on the Internet and transmits that information in the background to someone else. Use anti-spy ware programs.

• Use and Update Antivirus Software

• **Use Email Responsibly:** Many viruses and worms are spread via email. An attachment should not be opened unless it was specifically requested or expected. Since email worms are sent to addresses found on infected user's computers, just knowing the sender is no proof of intent.

Don't reply to any email that requests your personal information. Be very suspicious of any email from a business or person that asks for your password, credit card no or other highly sensitive information.

• **Protect Sensitive Data:** To protect hardware and software following things are to be performed.

END OF UNIT -1

=======BY PROF. ADARSH ANAND (G.P PURNEA)=====

UNIT – 02

Managing Storage devices

Syllabus:

Know about Semiconductor Memories – RAM, ROM on System Board, Main Memory – SIMMs, DIMMs, Other RAM Technologies, Hard drives – hard drive technology – IDE, EIDE, SCSI, SATA, Hard drive partitions, Trouble-shooting hard drives & data recovery, Optimizing Hard drive – disk clean-up, disk fragmentation. Disk backup.

1) What is memory?

A memory unit is an essential part of a computer system. A memory unit holds programs and data. It is very important for the computer designer to pay attention to the memory unit design because the memory system cost is significant fraction of the cost of the total system. The system performance is largely dependent on the organization, storage capacity and speed of operation of memory system.

A computer memory can be logically divided into three groups:

- Internal memory
- Main memory
- Secondary memory

Internal Memory: Each processor contains some registers. The operations performed by these registers are very fast. These registers can be used for storing data or instruction temporarily. These temporarily used registers as a working memory is known as internal processor memory. The cost involved in this type of memory is very high. So computer designers are forced to include only few registers in the CPU.

Primary Memory: Primary memory is the storage area in which all the programs are executed. The CPU can directly access only those items that are stored in primary memory. Therefore, all programs and data must be within the primary memory to speed up execution. Previously primary memory was designed using magnetic cores. In modern computers, MOS (Metal Oxide Semiconductor) technology is employed in primary memory design. Generally the size of primary memory is much larger than processor memory, and its operating speed is slower than processor memory. Primary memory plays very important role in system performance.

Secondary Memory: Secondary memory is also known as auxiliary memory or backup store. The primary memory has two limitations. First one it is volatile i.e. the contents will go if power is switched off. Second primary memory is limited.

So, to provide large, non volatile memory secondary memories are introduced. Secondary memory holds data and programs. Secondary memory is provided by storage devices like tapes, hard disks, floppy disks etc. Secondary memory devices are slow devices and provide huge storage capacity. Whenever we save a file, the file contents are

stored in secondary memory and whenever we open a file the file contents are brought from Secondary to primary memory.

2) What is Semiconductor memory? (This topic cover "Know about semiconductor memory")

Semiconductor memory is an electronic data storage device, often used as computer memory, implemented on a semiconductor-based integrated circuit.

Semiconductor Memories are classified according to the **type of data storage** and the **type of data access** mechanism into the following two

Main groups:

- Non-volatile Memory (NVM) also known as Read-Only Memory (ROM) which retains information when the power supply voltage is off.

Read/Write (R/W) memory, also known as Random Access Memory (RAM). From the point of view of the data storage mechanism RAM are divided into two main groups:

-Static RAM, where data is retained as long as there is power supply on.

- Dynamic RAM, where data is stored on capacitors and requires periodic refreshment.

ROM stands for Read Only Memory. You can read from it, but you cannot write to it without using special procedures. ROM is where your BIOS is stored. Unlike **RAM**, ROM is non-volatile. Even after you turn off your computer, the contents of the ROM remains available.

DIFFERENT TYPE OF ROM:

a) **PROM:** Programmable Read Only Memory requires a special machine called a PROM burner to burn the BIOS code into the chip. If this type of ROM needs updating, it usually means removing the whole chip and putting in a newer one.
b) **EPROM:** Erasable Programmable Read Only Memory also requires a special PROM burner to write the BIOS code, but it can be erased by shining ultraviolet light through a window on the top of the chip. This can only be done by a professional with the right equipment

c) **EEPROM:** Electrically Erasable Programmable Read Only Memory is erased by applying a slightly higher than normal voltage to the chip. Unlike the other types, EEPROM can be erased a byte at a time rather than all at once, and then written to. This type of ROM is found in devices like printers.

d) **RAM:** RAM stands for Random Access Memory. RAM is the place where your computer temporarily stores its operating system, application programs, and current data, so that the computer's processor can reach them quickly and easily. When refer to computer's memory, they mostly it means RAM, and it is volatile. Volatile means that when you turn off your computer, anything in RAM disappears or is erased.

Desktop computers usually come with 16 or more megabytes of RAM, usually increasing in multiples of 8 megabytes. If you use graphic applications, you probably have 32, 64 or more megabytes of memory. Most personal computers are designed so that you can add more RAM modules up to the limit imposed by the motherboard.

If you add more RAM to your computer, you reduce the number of times your processor must read data from your hard disk (Virtual Memory). This usually allows your computer to work considerably faster.

Again, RAM is volatile. It requires a steady flow of electricity to maintain its contents, so data stored in RAM stays there only as long as your computer is running. As soon as you turn the computer off, you lose everything that was in RAM.

When you turn your computer on again, your computer's boot firmware (called a BIOS on a PC) uses instructions stored semi-permanently in ROM chips to read your operating system and related files from the disk and load them back into RAM. On a Personal Computer, different parts of RAM may be more or less easily accessible to programs.

3) What is Main Memory? (This topic cover "Main Memory")

Primary Storage, or Internal Memory, is computer memory that is accessible to the central processing unit of a computer without the use of computer's i/o channels. Primary storage is used is typically very fast, as in the case of RAM.

1) **SIMM:** In earlier PCs, main memory was stored on the system board as single, socketed chips, but today RAM is coming in

SIMM(Single Inline Memory Module) or the DIMM(Dual Inline Memory Module) which will be inserted directly into the system board. The major difference between SIMM and DIMM is – the width of the data path. A SIMM has a data path of 32 bits, and DIMM has a data of 64 bits.

SIMM used first FPM and EDO technologies and DIMM using burst EDO then SDRAM and then Direct Ram bus technology. The goal of these technologies is to increase overall throughput.

FPM(Fast Page Mode) improved on the earlier memory types by sending the row address just once for many access to memory near that row address just once for many access to memory near that row. Earlier memory types required a complete row and column address for each memory access.

EDO(extended data out) is an improvement over FPM memory. It is faster because it allows the memory controller to eliminate the 10-ns delay while it waited before it issuing the next memory address.

2) DIMM Technologies:

A **DIMM**, or **Dual Inline Memory Module** comprises a series of random access memory integrated circuits. These modules are mounted on a printed circuit board and designed for use in personal computers. DIMMs began to replace SIMMs.

The first DIMMs used EDO or Burst EDO and then used synchronous RAM(SDRAM).

BEDO is reined version of EDO with improved access time over EDO. BEDO is not widely used because Intel chose not to support it.

Synchronous DRAM is currently the most popular memory type. SDRAM operates in synchronous with system clock where as others all run at a same speed.

3) SDRAM is in 3 variations:

- Regular SDRAM
- SDRAM II
- SYNCLINK(SLDRAM)

Regular SDRAM runs at the same speed as the system bus SDRAM data path is 64 bit wide.

Double data rate SDRAM(DDR SDRAM) sometimes called SDRAM II, runs twice fast as regular SDRAM. Instead of processing data for each pulse of the system clock as regular SDRAM does, it process data when pulse raises and again when it falls doubling the data when pulse raises and again when it falls doubling the data rate of memory.

SYNCLINK(SLDRAM) it improved on regular SDRAM by increasing the number of memory banks that can be accessed simultaneously from four to sixteen.

Other important variety of RAM is **Direct RAMBUS** RAM or **RDRAM.** It used the following principle "Narrow the data path and improve the rate of speed of data." The data path is 16 bits with this narrow data path they managed speeds of 400 MHz to 800 MHz So, design concept is totally different from others.

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4) What are Hard drives? (This topic cover "Hard Drives")

When the power to a PC is switched off, the contents of memory are lost. It is the PC's hard disk that serves as a non-volatile, bulk storage medium and as the repository for a user's documents, files and applications. In 1954, when IBM first invented the hard disk, capacity was a mere 5 MB stored across fifty 24 inch platters.

Inside a disk Drive:

Following Fig shows various components and their functions.

A — Platter: Stores the data

B — DC Spindle Motor: Spins the platter

C — Head: Reads or writes data from or to the platter

D — Actuator: Causes the arm to move

E — Printed-Circuit Cable: Connects arm and head to electronics.

F — Arm: Moves across the disk, positioning the head.

G — Chassis: Cast metal base on which other components are mounted.

H — Protective Cover: Seals the mechanism against dust.

J — Logic Circuits: Handle address translation, data buffering and I/O requests)

A computer interfaces is what allows a computer to send and retrieve information for storage devices such as computer hard disk drives and CD-ROM drives.

IDE:

Short for **integrated Drive**

Electronics or **IBM** Disc **Electronics, IDE** is more commonly known as ATA and a standard interface for IBM compatible hard drives. IDE is different from the Small Computer Systems Interface (SCSI) and Enhanced Small Device Interface (ESDI) because its controllers are on each drive, meaning the drive can connect directly to the motherboard or controller. IDE and its updated successor, Enhanced IDE (EIDE), are the most common drive interfaces found in IBM compatible computers today. Below is a picture of the actual IDE connector and cable.

EIDE is the current standard for inexpensive, high performance hard disks used in PCs.

EIDE stands for Enhanced IDE and it is registered name own by hard disk manufacture Western Digital. They also own the name "IDE".

Other companies like Seagate, IBM, Quantum and Maxtor Uses the term ATA, which stands for Advanced Technology Attachment. But it is all the same. However there are many different protocols behind the terms.

You can think of EIDE as a bus - which is a host controller - which controls it, and you can connect up to four units. Here you see the controller and its two channels

All Pentium system boards since 1995 have this EIDE controller built into the chip set. That allows the hard disk and other, EIDE units to be connected directly to the system board.

Improvements:

The EIDE standard is a great improvement over the old IDE. Here are some examples

• The hard disk can exceed the 528 MB IDE limit.

• The hard disk's interface is moved from the ISA bus to the high speed PCI bus.

• Four units can be connected to the system board, which has two EIDE channels. Each channel can be connected to a master and a slave unit.

The most important feature is the interface directly on the PCI bus. This has given EIDE transfer speeds and disk capacities, which far exceed older controller principles. Concurrently, there is a continual development of the protocols, which are needed for the connection between the units and the EIDE bus.

SCSI: SCSI stands for Small Computer System Interface and is a standard for communication between a subsystem of peripherals and the system bus. SCSI is like a small LAN inside a computer. SCSI is a kind of bus. The SCSI bus can contain up to 15 devices. The number of devices the SCSI bus can support depends on the type of SCSI being used,

As shown in figure, in IDE the CPU communicates with the hard drive controller, which is contained in the hard drive case, through the system bus. In SCSI, the CPU communicates over the system bus to the SCSI adapter. The SCSI adapter communicates with the hard drive controller.

SATA:

Serial ATA (SATA or Serial Advanced Technology Attachment) is a bus interface for connecting devices such as hard disk drives and optical drives. Serial ATA was designed to replace the older standards. It is able to use the same low level commands, but serial ATA host-adapters and devices communicate via a high-speed serial cable over two pairs of conductors. In contrast, the parallel ATA (the redesignation for the legacy ATA specifications) used 16 data conductors each operating at a much lower speed.

SATA offers several advantages over the older interface: Reduced cable-bulk and cost (reduced from 80 wires to seven), faster and more efficient data transfer, and hot swapping.

RAID:

RAID, an acronym for redundant array of independent disks, is a technology that provides increased storage reliability through redundancy, combining multiple low-cost, less-reliable disk drives components into a logical unit where all drives the array are interdependent.

RAID is the organization of multiple disks into a large, high performance logical disk.

Data striping also results in uniform load balancing across all of the disks, eliminating hot spots that otherwise saturate a small number of disks, while the majority of disks sit idle.

Disk arrays stripe data across multiple disks and access them in parallel to achieve:

- Higher data transfer rates on large data accesses and
- Higher I/O rates on small data accesses.

The need for RAID can be summarized in two points given below. The two keywords are Redundant and Array.

• An array of multiple disks accessed in parallel will give greater. Throughput than a single disk.

• Redundant data on multiple disks provides fault tolerance.

5) How we can do Hard drive Partition? (This topic cover "Hard Drive Partition")

You can divide single physical drive into more than one logical drive, which is called partitioning drive. Two kinds of divisions take place. First the physical drive is divided into one or more partitions, and then each partition further divided into logical drives. A logical drive is also known as logical partition.

Following figure shows a typical example. The hard drive is drive is divided into two partitions. The first partition contains one logical drive (drive C) and the second partition is divided in to two logical drives D and E.

The partition table at the beginning of the drive records all these divisions.

6) What are the symptoms of troubleshooting hard drives?

Typical symptoms associated with hard disk drive failures include the following:

• The front panel indicator lights are visible, and the display h present on the monitor screen, but there is no disk drive action and no bootup.

• The computer boots up to a system disk in the A drive, but not to the hard drive, indicating that the system files on the hard disk drive (l-IDD) are missing or have become corrupt.

• The computer does not boot up when turned on.

• An IBM-compatible l7xx error code is produced on the display.

• No motor sounds are produced by the HDD while the computer is running. (In desktop units, the HDD should generally always run when power is applied to the system—however, this does not apply to all desktops or portables when advanced power- saving features are used.)

• A HDD Controller Failure message appears, indicating a failure to verify hard disk setup by system configuration file error.

• A C: or D: Fixed Disk Drive error message appears, indicating a hard disk CMOS setup failure.

• An Invalid Media Type message appears, indicating the controller cannot find a recognizable track/sector pattern on the drive.

• A No Boot Record Found, a Nonsystem Disk or Disk Error, or an Invalid System Disk message appears, indicating that the system boot files are not located in the root directory of the drive.

• The video display is active, but the HDD's activity light remains on and no bootup occurs, indicating that the HDD's CMOS configuration information is incorrect.

• An Out of Disk Space message appears, indicating that the amount of space on the disk is insufficient to carry out the desired operation.

• A Missing Operating System or a Hard Drive Boot Failure message appears, indicating that the disk's MBR is missing or has become corrupt.

• A Current Drive No Longer Valid message appears, indicating that the HDD's CMOS configuration information is incorrect or has become corrupt.

7) How the data can Recover?

Due to the enormous amount of important data that is not backed up regularly and is therefore lost to failed hard disks every year, special companies have come up to access and retrieve data on disks that under normal circumstances would never be readable again. This process is called data recovery. This is expensive. So perform the following yourself.

Some drive failures are actually failures of the integrated controller board, and if you swap this board with an identical one from another drive, you may be able to get the drive working. You can only do this with a spare board from an identical board. Needless to say, this is tricky business so proceed with caution.

• Older drives, from around 1990 or before, often fail by refusing to spin up at all. If this is the case, sometimes it is caused by the spindle motor getting "stuck", and manually spinning the motor up will allow the drive to spin free long enough to get the data off of it. The idea is simple: open up the disk and manually move the platters — don't touch the platters,

rotate the hub in the middle — and then turn the disk on and it may spin up. Empty the disk to another device and then throw the disk out. It can work — but it is a very risky thing to do and will void the warranty on any disk you try it on. Also, it only generally helps on very old disks that are physically jammed and thus won't spin up at all when the power is applied. If the disk is spinning then this technique does not apply, and never try it on a newer drive.

- On rare occasions, simply retrying booting up the hard disk will solve the problem. Always wait at least 15 seconds after turning off a PC before turning it back on again.

- Number data recovery tools are available. Use them to recover data.

- Finally, Contact a data recovery company and ask them for an assessment.

8) What is optimization of hard drive?

Disk optimization is a process in which the physical locations of files on a disk are re-arranged in order to improve data access times and minimize time moving a hard drive's head. The following are some disk optimization techniques

- Disk defragmentation

- Removal of cross linked and lost clusters

- Disk compression

- Disk caching

Fragmentation is the undesirable placement of a single file in several locations that are not side by side. So the data access time is increased. When the hard disk new and freshly formatted, the OS writes the files in consecutive locations. Each new file begins with next available cluster. But when files are deleted free space is created in between the files. OS stores new files in these free space which are created due to deletion of files. When no files are created and deleted a file will scatter all over the disk. The problems with fragmentation are

- Disk accessing takes more time

- If a file becomes corrupted, recovery becomes more complicated.

To overcome the problems the hard disks are to be defragmented periodically. For defragmentation, Defragmenter utility is available in Windows 9X.

3.6. 1 CROSS LINKED CLUSTER AND LOST CLUSTERS

If the File Allocation Table becomes corrupted, there is a chance for creation of lost cluster or cross linked clusters as shown in the following figure.

In the figure file 3 has lost direction and is pointing to a cluster chain that belongs to file 4. Clusters 29-3 1 are called cross linked clusters because more than one file points to them and clusters 15-17 and 28 are called lost clusters because no file in the FAT points to them. To repair cross linked and lost clusters, use **scan disk** utility in either DOS or Windows 9X.

3.6.2 DISK COMPRESSION

A **disk compression** software utility increases the amount of information that can be stored on a hard disk drive of given size. Unlike a file compression utility which compresses only specified files - and which requires the user designate the files to be compressed-a disk compression utility works automatically and user doesn't need to be aware of its existence.

A compressed drive is not a drive at all. Following figure shows the two parts of a compressed drive. As shown in the figure, the host drive contains a special file called CVF (Compressed Volume File). The CVF file holds everything on the drive C, compressed into one file.

Disk compression utilities were popular especially in the early 1990s, when computer hard disks were still relatively small (20 to 80 megabytes). A good disk compression utility could, on average, double the available space with negligible speed loss.

3.6.3 DISK CACHE:

A disk cache is a temporary storage area in RAM for data read from or written to a hard drive to speed up access time to the drive.

3.6.4 DISK CLEANUP:

The Disk Cleanup tool helps you free up space on your hard disk by searching your disk for files that you can safely delete. You can choose to delete some or all of the files. Use Disk Cleanup to

perform any of the following tasks to free up space on your hard disk:

• Remove temporary Internet files.

• Remove downloaded program files. For example, ActiveX controls and Java applets that are downloaded from the Internet.

• Empty the Recycle Bin.

• Remove Windows temporary files.

• Remove optional Windows components that you are not using.

• Remove installed programs that you no longer use.

• You can start Disk Cleanup, by doing any of the following:

• Click **Start**, and then click **Run**. In the **Open box**, type **cleanmgr**, and then click **OK**.

-Or-

• Click **Start**, point to **All Programs**, point to **Accessories**, point to **System Tools**, and then click **Disk Cleanup.**

-Or-

• In Windows Explorer or **My Computer**, right-click the disk in which you want to free up space, click **Properties**, click the **General** tab, and then click **Disk Cleanup**.

9) What do you mean by disk backup?

Backup lets you back up data to a file or to a tape. When you back up data to a file, you have to designate a file name and a location for the file to be saved. Backup files usually have the extension .bkf, but you can change it to any extension. A backup file can be saved to a hard disk, a floppy disk, or to any other removable or non-removable media on which you can save a file.

The following four steps describe a simple backup operation:

• Select files, folders, and drives for backup

• Select storage media or file location for backed-up data

• Set backup options

- Start the backup

----------End of Unit -2 ----------
----------by Prof. Adarsh Anand (G.P Purnea)------

UNIT – 03

Troubleshooting Fundamentals

Syllabus:

Troubleshooting tools − Bootable rescue disk, diagnostic software, virus detection software, Anti-Static tools, Trouble-shooting guidelines − Power system, system board, OS &hard drive, Optical drives, keyboard, Monitor and printer problems, Surge protection & battery backup, Stand by UPS, Inline UPS, Line-interactive UPS, and Intelligent UPS.

1) What is troubleshooting?

Troubleshooting is a systematic approach to problem-solving that is often used to find and correct issues with complex machines, electronics, computers and software systems.

Trouble shooting procedure can be broken down into four steps

1. Define the symptoms

2. Identify and isolate the potential source of the problem

3. Repair or replace the suspected component or subassembly

4. Retest the system thoroughly to be sure that you have solved the problem.

<u>The following precautions you must observe to prevent damage to yourself or to the PC.</u>

- Keep out of the display chassis

- Be very careful when troubleshooting the power supply. If you are not experienced in high voltage circuitry, stay out.

- Turn the power off, ground yourself against static electricity and pull the plug when doing anything inside the chassis except energized system trouble shooting.

- Handle diskettes carefully

- Don’t cycle the power quickly

- Use a power strip to apply power to all components except for hard disk drives.

- Keep liquids away from the computer.

- Handle components with care.

Observing these precautions one can save time, money and frustration.

2) What are the troubleshooting Tools?

Tools that are essential for PC trouble shooting are listed below.

- Phillips-head screwdriver - A couple of sizes here are a good idea

- Extractor, a spring - Loaded device that looks a bit like a hypodermic syringe.

- Tweezers - For picking pieces of paper out of printers or dropped screws from tight places. Surgical forceps are also good.

- Flathead Screwdriver - A wide blade and a narrow blade are useful.

- Chip Extractor to Remove Chips - This is not done very often. I would put it in the second list

- Socket drivers for hex nuts and hex screws

- Bootable rescue disk

- Torx screwdrivers

Handy equipment that it would be good to have:

- Multi meter to check the power supply output. Can also be used to check circuit continuity.

- Needle-nose pliers for holding objects in place

- Flashlight to see inside the PC case

- AC outlet ground tester

- Small cups or bags to keep screws

- Antistatic bags to store unused parts

- Pen and paper for taking notes

- Diagnostic software

- Utility software

- Virus detection software on disks.

3) What do you mean by bootable rescue disk?

A Rescue Disk (either Floppy or CD) is useful in restoring a computer if it becomes non-bootable. The Rescue Disk is a

bootable disk, which contains critical System information. This disk can restore corrupt boot sectors and partition table. As the Rescue Disk can replace corrupt boot sectors and partition table with a clean copy, it is a generic solution to all kinds of boot sector viruses. It is always advisable to keep track of the rescue drive for the systems.

To create rescue disk iii Windows 9X follow the steps

1. Click on start then settings and then click on control panel

2. In the control panel window, double click the add/remove programs icon.

3. Click the startup disk tab, button. The disk will then

4) What do you mean by Diagnostic software?

Diagnostic software plays an important role in computer hardware servicing. Generally these software's are used to identify the installed computer parts, analyze disk drives and test the working conditions of the devices and ports. Some of the diagnostic software's are used to perform some machine level tasks like low level formatting, sector reading, FAT and partition table analyzing.

List of Diagnostic Software's: The following are the most commonly used diagnostic software's:

• Microsoft diagnostics-DOS MSD command

• Norton utilities

• CHECKIT

• Quick Analysis (QA+) and

ATDIAGS

These utility programs are available for both DOS and Windows environment.

5) What do you mean by Virus detection software?

Virus detection software, sometimes called virus scanners. Virus scanners are programs which search the system areas as well as program files for known virus infections. These scanner programs

search for a specific virus code sequence called signatures within a normal program to check for any virus infection.

There are two common methods that an anti-virus software application uses to detect viruses. The first, and by far the most common method of virus detection is using a list of virus signature (the distinguishing characteristic of a virus) definitions. The disadvantage of this detection method is that users are only protected from viruses that pre-date their last virus definition update. The second method is to use a heuristic algorithm to find viruses based on common behaviors. This method has the ability to detect viruses that anti-virus security firms' have yet to create a signature for.

Some Popular Virus Detection Softwares: Norton antivirus software, MacAfee antivirus software, Quick heal antivirus software.

Symptoms/Warning Signal about Virus: When a virus is active, one of the following symptoms may occur

- The computer runs more slowly than normal
- The computer stops responding or looks up
- The system frequently restarts automatically
- Although the computer restarts on its own, it faisl to run normally
- Applications on the computer don't work correctly
- Disk drives are inaccessible

6) What do you mean by Antistatic tools?

Static electricity is a very high voltage (potential difference) stored in an insulated body. Although, the voltage is high, the amount of electro static discharge current that it can sustain is very low and so static electricity is not that harmful.

An electronic component, such as a memory or logic chip, is composed of fine, conductive metal oxides deposited on a small piece of silicon. Its dimensions are measured in fractions of micron (one millionth of a millimeter). Any static electricity discharged into this structure will spark between conductive tracks, damaging them. This may make the chip completely unusable.

To protect, components and components from ESD damage, make sure that your body and clothing are drained of static electricity before starting work.

Following tools are widely used to handle ESD problem

1. Anti ESD Work Bench: An **anti-static workbench** is one that is grounded so that static electricity and ESD does not affect the products being worked on

Anti Static Strip:

An antistatic wrist strap, ESD wrist strap, or ground bracelet is an antistatic device used to prevent electrostatic discharge (ESD) by safely grounding a person working on electronic equipment.

Anti Static Mats: These mats are layed on work place area to control the static electricity

Anti Static Slipper: Anti static slippers are used in electronic industry, explosive industry etc to drain the static electricity safely while working.

Anti Static Bag: An **antistatic bag** is a bag used for shipping or storing electronic components, which are prone to damage caused by electrostatic discharge.

Power system, system board, OS, hard drive, Optical drives, keyboard, Monitor and printer problems.

7) What are the guide lines for troubleshooting?

Systematic trouble shooting means logical approach. It is a scientific and analytical process. The systematic trouble shooting approach can be divided into following steps

- Symptom observation
- Symptom analysis
- Fault diagnosis
- Fault rectification.

❖ **Symptom Observation:**

One should be very careful in observing the fault symptoms while trouble shooting. It is common that while troubleshooting

the system, one will notice one or two symptoms and ignores remaining symptoms. But in case of multiple faults it will be impossible to locate the exact fault or it will take more time and thus the downtime will be increased. So for efficient troubleshooting one should systematically approach a problem and starts troubleshooting with patience and careful observation of the symptoms. The time spent on symptoms observation in turn will yield proportional return during fault location.

- **Symptom Analysis:**

The most important step in troubleshooting is the systematic analysis of the symptoms. A careful analysis of the symptoms will give a clue to the fault location process. When there are multiple symptoms one should try to correlate the various symptoms to identify the problems. If any relationship or clue is found, several steps can be skipped during fault location, thereby reducing the down time considerably.

- **Fault Diagnosis:**

Fault diagnosis is highly sophisticated scientific process. It needs intelligence, presence of mind and detective skill on the part of the engineer. The most important point here is the multidimensional view to be applied by the hardware engineer while troubleshooting problems.

Fault rectification;

And finally rectify the identified fault.

8) HOW TO DO POWER SUPPLY TROUBLESHOOTING?

Typical symptoms associated with power-supply failures include the following:

• No indicator lights are visible, with no disk drive action and no display on the screen. Nothing works, and the system is dead.

• The On/Off indicator lights are visible, but there is no disk drive action and no display on the monitor screen. The system fan might or might not run.

• The system produces a continuous beep tone.

Checking Dead Systems:

Special consideration must be taken when a system is inoperable. In a totally inoperable system, there are no symptoms to give clues where to begin the isolation process. In addition, it is impossible to use troubleshooting software or other system aids to help isolate the problem.

When the system exhibits no signs of life — including the absence of lights — the best place to start looking for the problem is at the power supply. The operation of this unit affects virtually every part of the system. Also, the absence of any lights working usually indicates that no power is being supplied to the system by the power supply.

1. Check the external connections of the power supply. This is the first step in checking any electrical equipment that shows no signs of life.

2. Confirm that the power supply cord is plugged into a functioning outlet.

3. Verify the position of the On/Off switch.

4. Examine the power cord for good connection at the rear of the unit.

5. Check the setting of the 110/220 switch setting on the outside of the power supply. The normal setting for equipment used in the United States is 110.

6. Check the power at the commercial receptacle using a voltmeter, or by plugging in a lamp (or other 110-volt device) into the outlet.

CAUTION:

Before changing any board or connection, always turn the system off first.

9) How to do system board troubleshooting?

The microprocessor, RAM modules, ROM BIOS, and CMOS battery are typically replaceable units on the system board.

Both the microprocessor and the ROM BIOS can be sources of such problems. You should check both by substitution when dead system symptoms are encountered but the power supply is good.

System Board Symptoms: Typical symptoms associated with system board hardware failures include the following

• The On/Off indicator lights are visible and the display is visible on the monitor screen, but there is no disk drive action and no bootup occurs.

• The On/Off indicator lights are visible and the hard drive spins up, but the system appears dead and there is no bootup.

• The system locks up during normal operation.

• The system produces a beep code with one, two, three, five, seven, or nine beeps (BIOS dependent).

• The system produces a beep code of one long and three short beeps (BIOS dependent).

• The system does not hold the current date and time.

• A DMA Error message displays, indicating a DMA controller failed page register test.

• A CMOS Battery Low message displays, indicating failure of the CMOS battery or the CMOS checksum test.

• A CMOS Checksum Failure message displays, indicating that the CMOS battery is low or a CMOS checksum test failure.

• A 201 error code displays, indicating a RAM failure.

•A Parity Check error message displays, indicating a RAM error.

Typical symptoms associated with system board CMOS setup failures include the following:

• A CMOS Inoperational message displays, indicating failure of CMOS

• A CMOS Memory Size Mismatch message displays, indicating a system configuration and setup failure.

• A CMOS Time & Date Not Set message displays, indicating a system configuration and setup failure.

Typical symptoms associated with system board I/O failures include the following:

• The speaker doesn't work during operation. The rest of the system works, but no sounds are produced through the speaker.

• The keyboard does not function after being replaced with a known-good unit.

Configuration Problems:

Configuration problems typically occur when the system is being set up for the first time, or when a new option has been installed. The values stored in CMOS must accurately reflect the configuration of the system; otherwise, an error occurs. Incorrectly set CMOS parameters cause the corresponding hardware to fail. Therefore, check the enabling functions of the advanced CMOS settings as a part of every hardware configuration troubleshooting procedure.

Microprocessors:

In the event of a microprocessor failure, the system might issue a slow single beep from the speaker along with no display or other I/O operation. This indicates that an internal error has disabled a portion of the processor's internal circuitry (usually the internal cache). Internal problems can also allow the microprocessor to begin processing, but then fail as it attempts additional operations. Such a problem results in the system continuously counting RAM during the bootup process. It might also lock up while counting RAM. In either case, the only way to remedy the problem is to replace the microprocessor.

RAM:

RAM failures basically fall into two major categories and create two different types of failures

• **Soft-Memory Errors:** Errors caused by infrequent and random glitches in the operation of applications and the system. You can clear these events just by restarting the system.

• **Hard-Memory Errors:** Permanent physical failures that generate NMI errors in the system and require that the memory units be checked by substitution.

Observe the bootup RAM count on the display to verify that it is correct for the amount of physical RAM actually installed in the system. If not, swap RAM devices around to see whether the count changes. Use logical rotation of the RAM devices to

locate the defective part. The burn-in tests in most diagnostic packages can prove helpful in locating borderline RAM modules.

ROM:

A bad or damaged ROM BIOS typically stops the system completely. When you encounter a dead system board, examine the BIOS chip for physical damage. If these devices overheat, it is typical for them to crack or blow a large piece out of the top of the IC package. Another symptom pointing towards damaged BIOS involves the bootup sequence automatically moving into the CMOS configuration display, but never returning to the bootup sequence. In any case, you must replace the defective BIOS with a version that matches the chipset used by the system.

CMOS Batteries:

The second condition that causes a configuration problem involves the system board's CMOS backup battery.

If a system refuses to maintain time and date information, the CMOS backup battery or its recharging circuitry i normally faulty. After the backup battery has been replaced,1 check the contacts of the battery holder for corrosion.

If the battery fails, or if it has been changed, the contents the CMOS configuration are lost. After replacing the battery, it is always necessary to access the CMOS setup utility tc reconfigure the system.

10) How to do hard disk troubleshooting?

Typical symptoms associated with hard disk drive failures include the following:

• The front panel indicator lights are visible, and the display h present on the monitor screen, but there is no disk drive action and no bootup.

• The computer boots up to a system disk in the A drive, but not to the hard drive, indicating that the system files on the hard disk drive (l-IDD) are missing or have become corrupt.

• The computer does not boot up when turned on.

• An IBM-compatible l7xx error code is produced on the display.

• No motor sounds are produced by the HDD while the computer is running. (In desktop units, the HDD should generally always run when power is applied to the system—however, this does not apply to all desktops or portables when advanced power- saving features are used.)

• A HDD Controller Failure message appears, indicating a failure to verify hard disk setup by system configuration file error.

• A C: or D: Fixed Disk Drive error message appears, indicating a hard disk CMOS setup failure.

• An Invalid Media Type message appears, indicating the controller cannot find a recognizable track/sector pattern on the drive.

• A No Boot Record Found, a Nonsystem Disk or Disk Error, or an Invalid System Disk message appears, indicating that the system boot files are not located in the root directory of the drive.

• The video display is active, but the HDD's activity light remains on and no bootup occurs, indicating that the HDD's CMOS configuration information is incorrect.

• An Out of Disk Space message appears, indicating that the amount of space on the disk is insufficient to carry out the desired operation.

• A Missing Operating System or a Hard Drive Boot Failure message appears, indicating that the disk's MBR is missing or has become corrupt.

• A Current Drive No Longer Valid message appears, indicating that the HDD's CMOS configuration information is incorrect or has become corrupt.

HDD Configuration Checks:

While booting up the system, observe the BIOS's HDD type information displayed on the monitor. Note the type of HDD that the BIOS recognizes as being installed in the system. Possible error messages associated with HDD configuration problems include the Drive Mismatch Error message and the Invalid Media Type message.

Basic HDD Checks:

The first task is to determine how extensive the HDD problem is. Place a clean boot disk or an emergency start disk in the A drive and try to boot the system. Then execute a DIR command to access the C drive. If the system can see the contents of the drive, the boot files have been lost or corrupted, but the architecture of the disk is intact.

If you cannot access the hard disk drive, and its configuration settings are correct, you must troubleshoot the hardware components associated with the hard disk drive. These components include the drive, its signal cable, and the Hard Disk Controller (HDC) on the system board. Check the HDD signal cable for proper connection at both ends. Exchange the signal cable for a known-good one.

Check the Master/Slave jumper settings to ensure they are set correctly. Determine whether the system is using the Cable Select option. This setting enables the system to dynamically assign the master/slave arrangements for multiple IDE drives. Likewise, check the ID configuration settings and terminator installations for SCSI drives.

Although it might seem logical to replace the hard drive unit at this point, it is quite possible that the hard drive might not have any real damage. It might have simply lost track of where it was, and now it cannot find its starting point. In this case, the most attractive option is to reformat the hard disk. This action gives the hard drive a new starting point from which to work. Unfortunately, it also destroys anything that you had stored on the disk.

If the reformatting procedure is not successful, or the system still doesn’t boot from the hard drive, replace the hard disk drive unit with a working one.

11) What to do you mean by Optical drive troubleshooting?

Optical drive trouble shooting issues can be hardware and software related. The affected components are the following:

- Optical drive
- Optical media
- Software

CD-ROM and DVD-ROM Common Issues:

Drive cannot read an Audio CD or any discs

The BIOS does not recognize the drive

The drive is not recognized or seen in Windows

"Not Ready Reading Drive" error

Data error reading drive X: while trying to read a CD.

The driver may be corrupted or missing. (Code 19, Code 32, Code 31, Code 39 or Code 41)" in Device Manager Error on CD/DVD drive.

CD-DVD drive cannot open.

CD-drive has no power.

Troubleshooting CD-Rom and DVD-ROM Read Issues:

Ensure that the disk is not dirty or scratched.

Try another CD or DVD (preferably not a burned CD).

Try another disk-reading software (Windows Media Player, Power DVD).

Check if the drive is properly detected in My Computer and in the Device Manager. If there is an error code in the Device manager

• If the driver is not detected in the Device manager and in my computer have the customer check if it is properly detected in BIOS as the "Secondary Master". If the drive is still not detected in BIOS, have the customer reseat the cables and reset BIOS to defaults.

• If detected, test the drive in DOS mode by booting to "bootable" disc to see if the CD is recognized. You can have the customer use the Restore CDs, or the created back up restore discs.

• If the drive sees the Bootable disc, it means that this is an Operating system issue. Remove the optical drive is Safe Mode.

• After reloading Optical drive in Safe Mode and if the drive is properly detected in My Computer and in the Device Manager, consider running a Full System Restore on that computer.

Here are some basic troubleshooting steps for write issues:

• Verify if the customer have a pre-installed burner drive (CD-RW drive or a DVD-RW drive).

• Double check that the CD is not dirty or scratched.

• Try another blank CD, preferably other brand.

• See to it that disks comply with the drive specifications (dual - layer disks require dual - layer drives).

• Use a CD lens cleaner before burning a file.

• If the CU own a combo drive (CD/DVD) there are possibilities that the lens are defective.

• Check if the customer is getting any error codes when burning a file.

• Try another burning software (Note: The built-in Windows burning software does not support writing on a DVD).

12) How to do Keyboard troubleshooting?

Most of the circuitry associated with the computer's keyboard is located on the keyboard itself. However, the keyboard interface circuitry is located on the system board. Therefore, the steps required to isolate keyboard problems are usually confined to the keyboard, its connecting cable, and the system board.

Keyboard Symptoms: Typical symptoms associated with keyboard failures include the following:

• No characters appear onscreen when entered from the keyboard.

• Some keys work, whereas others do not work.

• A Keyboard Error — Keyboard Test Failure error appears.

• A KB/Interface Error — Keyboard Test Failure error appears.

• An error code of six short beeps is produced- during bootup (BIOS dependent).

• The wrong characters are displayed.

• An IBM-compatible 301 error code appears.

• An Unplugged Keyboard error appears.

• A key is stuck.

Basic Keyboard Checks:

The keys of the keyboard can wear out over time. This might result in keys that don't make good contact (no character is produced when the key is pressed) or that remain in contact (stick) even when pressure is removed. The stuck key produces an error message when the system detects it; however, it has no way of detecting an open key.

An unplugged keyboard, or one with a bad signal cable, also produces a keyboard error message during startup. Ironically, this condition might produce a configuration error message that says "Press F1 to continue."

If the keyboard produces odd characters on the display, check the Windows keyboard settings in Device Manager. If the keyboard is not installed or is incorrect, install the correct keyboard type. Also, be certain that you have the correct language setting specified in the Keyboard Properties dialog box (found by double-clicking the Keyboard icon in Control Panel).

Keyboard Hardware Checks:

If you suspect a keyboard hardware problem, isolate the keyboard as the definite source of the problem (a fairly easy task). Because the keyboard is external to the system unit, detachable, and inexpensive, simply exchange it with a known-good keyboard.

If the new keyboard works correctly, remove the back cover from the faulty keyboard and check for the presence of a fuse in the +5V DC supply and check it for continuity. Neither the older five-pin DIN nor the six-pin PSI2 mini-DIN keyboards can be hot-swapped. Disconnecting or plugging in a keyboard that has this type of fuse while power is on can cause the keyboard to fail. If the fuse is present, simply replace it with a fuse of the same type and rating.

If replacing the keyboard does not correct the problem, and no configuration or software reason is apparent, the next step is to troubleshoot the keyboard receiver section of the system board. On most system boards, this ultimately involves replacing the system board.

13) How to do monitor troubleshooting?

The monitor is the difficult peripheral to troubleshoot due to the presence of analog components as well as high voltage presence inside the monitor. Before trouble shooting the monitor one should have a fair knowledge of operation principle. Generally monitors are quite reliable but a gradual appearance of faults with age is very common. Many display related problems are caused by incorrect configuration and cable fault.

14) How to do Printer troubleshooting?

Following are the steps one should take when something goes wrong with the printer. When a printer is not printing, or printing wrong characters the problem could be in the computer or in the software. It could be also being that the printer interface or the cable or the printers itself are the reason behind this problem.

• Check if the printer is on-line, plugged to the mains, has paper and is in power on position. Make sure that the on-line indicator is glowing. Make sure that the paper tray selected has paper in it.

• Switch off the printer and the system. Switch on the printer and then switch on the system and try printing once again.

• If the problem continues, disconnect the printer and do a self test of the printer, most of the printer have some type of self test procedures.

• If the self test is ok then instead of using some software to test the printer, do a print screen or use the DOS redirection as given below.

C:\DOS>DIR>LPT1: (if the printer is connected to LPT1)

C:\DOS>DIR>COM1: (if the printer is connected to COM1)

These commands send the directory listing to the printer connected to the parallel port LPT1: or serial port COM1:

• If the directory listing appears on the printer then the fault is with the software being used, otherwise change the printer data cable with another working cable and try again.

• If nothing works then replace the printer interface board and try again.

Diagnosing Problems:

It is usually clear if a problem is mechanical in nature. If paper is not feeding correctly, or print quality

is poor because the print head is worn or malfunctioning, the solution involves dismantling the printer and possibly replacing some parts. The following are some common problems you may encounter and suggested actions

Printer does not Print:

If your printer does not print, check the following:

• Make sure that the printer is turned on-the power light should be on.

• Make sure that the printer should be on.

• Make sure that the printer is connected to the computer by a suitable cable

• If the printer is connected to a printer sharer, check that the sharer switch is on and has selected proper computer and printer.

• Check that the software you are using has selected proper printer.

If the printer still does not print, then try self test. If the self test works correctly then the problem lies with the cable or the computer. If the self test does not work then the problem is with the printer and the printer needs servicing.

Printer does not work; dead printer:

• AC input voltage improper, check AC input voltage.

• Power supply fuse may have blown, check the fuse provided on the printer and replace with fuse of the same type and rating.

After Printing some Characters, Printer Stops:

This problem mostly happens if you are using serial communication. if computer and printer are using different protocol then this problem could happen.

Non-uniform printing density/printing is faint

This is most likely due to old ribbon. This could also be due to mis-adjustment of the plate gap, check and adjust the gap between the platen and the print head.

Tip of the print head's dot wire is worn out; this will need replacement of the print head.

Error! Reference source not found.

This problem could be due to ribbon not being seated properly in the ribbon carriage. This could also due to the print head being old.

A Black/white horizontal lines along each line/missing dots during printing:

A black or white horizontal line along each line of the printout could be due to some problem with the print head pin has or due to some problems in the cable that connects print head to the printer electronics.

This problem could also be due to

• Tip of the print dot pin being worn out, replace head to correct

• Dust around the print head connector, clean the connector

• Loose connections of the head data ribbon, check and connect firmly

• Fault in the printer electronics, service printer.

Ready light on the control panel flickers, nothing is printed:

This shows that the data sent to the printer is reaching the printer, but it is not being interpreted properly by the printer.

This problem could be due to bad printer cable or the printer not being setup properly.

ONLINE light on the control panel flickers, nothing is printed:

If you are printing a lot of graphics or text information then the print head will get hot. When the print head becomes hotter than a preset temperature, the machine will stop printing with ONLINE light flashing.

In this situation no data is lost, when the temperature returns to normal the printing process will restart.

Self Test Pattern is not proper:

If the self test printed by the printer is not as it should be then there is some problem with the printer. Check power, print head, print head data ribbon (connecting the print head to the printers main board) etc.

Printer does not print During Self Test:

Check for loose connections in the print head data ribbon. Loose con nections in the connector/cable between printer electronics and printer mechanism, check the connectors and cables.

Difficult in Paper Loading:

One should always choose correct paper to make the paper insertion process easy. Many of the printers provide automatic paper feeding facility to prevent waste of paper and from problems

Of Feeding the Paper:

Sometimes if the paper is very thick or if proper friction is not available then the platen will turn but the paper will not feed. Adjust for paper thickness using the thickness adjustment leaver provided on most of the printer.

Printer runs out of paper when printing a long document:

Most of the Dot matrix printer has a paper sensor to sense. The end of the paper, when this sensor is active, if the finishes, when the printing job is going on, the printer senses and goes this into off line position.

After providing more paper to the printer and by making the printer on-line, one can resume the printing process.

Hello world

Hello world

Carriage does not move after power on: This could be due to some contact problem in the cable connections between the printer electronics and printer mechanism, check the connectors and cable for loose contact, short and open connections.

End of paper is not sensed and printing continues without paper:

Check for defective paper end sensor, micro switch in the paper end sensor could be defective. This could also be due to the paper end sensing being disabled by giving control command to the printer.

Check if the paper end sensor is working by removal and insertion of paper; make sure that the paper end sensing is not disabled by the software.

15) How to do operating system troubleshooting?

Here we will consider the Windows XP operating system and let us see frequently appeared problems and solutions for them

Error messages encountered during boot before Windows loads:

1. Ensure that your computer BIOS settings are correctly configured to the hardware that is installed in your computer. Improper settings in the BIOS may cause various types of errors when first booting an IBM compatible computer. These errors often occur as the computer is first booting and may stop the load process of the computer.

Error Messages while Windows is loading:

Errors that occur while Windows XP is loading and/or or prevent Windows XP from loading are likely being caused by a configuration error in the registry.

1. If you have recently changed or installed something that could have caused Normal Windows to stop loading, try loading the last known good configuration.

2. If you are unable to get into Normal Windows and believe that removing or uninstalling a program or changing a setting may

help enable you to get into Windows, boot the computer into Windows XP Safe Mode.

3. If your computer has worked fine in the past but recently has been experiencing the issue you're encountering, run the System Restore option to restore the computer to an earlier date.

Other error messages that occur while Windows is loading or after Windows is loaded:

Errors that have occurred while Windows is loading and/or after Windows has completed loading are often caused by a program that is automatically loading each time Windows is loading, problem or misconfiguration of a hardware device, or computer virus.

1. If errors occur but Microsoft Windows still loads, verify no issues or conflicts exist in Device Manager. If errors are found, read through our Device Manager page for steps on resolving issues.

2. Ensure that if programs are loading automatically, the errors are not associated with these programs. Many times utilities such as virus programs may attempt to load when Windows first starts and cause errors to occur. If you believe that your startup errors are associated with another program,

3. Make sure Windows XP is up to date by checking Microsoft Windows update page.

4. If your computer has a virus protection program installed, make sure it is up to date and that no viruses are being detected. If your computer does not have a virus protection program, you may wish to consider installing a program to make sure no viruses are causing your problems.

5. If your computer has worked fine in the past but recently has been experiencing this issue, run the System Restore option to restore the computer to an earlier date.

Other Error Messages:

If you are experiencing other error messages, it is likely these errors are being caused by the software program you are running and/or a hardware device you are attempting to utilize. It is recommended you see the basic troubleshooting section for your hardware device or software program.

Computer Running Slowly:

1. Make sure your computer has at least 500MB of free hard disk drive space. If your computer has less than 500MB free, it may cause the computer to operate more slowly.

2. Run Microsoft Scandisk and Defrag on the computer. Additional information and help with these commands can be found on our scandisk page and our defrag page.

3. Close any programs that are running in the background, and/or disable background programs from automatically loading each time your computer boots.

4. Click Start, Search, and click For Files or Folders. In the search window, search for files named *.tmp and make sure you are searching or looking in the local C: drive. Once search has completed, delete any files found.

5. Ensure that no errors or conflicts exist in the Device Manager.

6. Make sure Windows XP is up to date by checking Microsoft Windows update page.

7. Delete all files in your Windows Pre fetch directory. These files can lower overall system resources if loading programs no longer being used.

8. Ensure your computer has the latest drivers for the I hardware devices installed in your computer.

9. If your computer has a virus protection program installed, make sure it is up to date and that no viruses are being detected. If your computer does not have a virus protection program, you may wish to consider installing a program to make sure no viruses are causing your problems.

10. If your computer has worked fine in the past but recently has been experiencing this issue, run the System Restore option to restore the computer to an earlier date.

16) How to do surge protection and battery backup?

Surge protection and battery backup one of the important equipment you. Need for your computer is a surge protector. They allow you to plug multiple components into one power

outlet. The other function of the surge protector is to protect the devices from electric surges.

How Surge Protector Works: A simple MOV surge protector with line conditioning and a fuse:

A standard surge protector passes the electrical current along from the outlet to a number of electrical and electronic devices plugged into the power strip. If the voltage from the outlet **surges or spikes** —— rises above the accepted level —— the surge protector diverts the extra electricity into the outlet's grounding wire.

In the most common type of surge protector, a component called a **metal oxide varistor,** or **MOV**, diverts the extra voltage. As you can see in the diagram below, an MOV forms a connection between the hot power line and the grounding line.

An MOV has three parts: a piece of **metal oxide** material in the middle, joined to the power and grounding line by **two semiconductors.**

These semiconductors have a variable resistance that is dependent on voltage. When voltage is below a certain level, the electrons in the semiconductors flow in such a way as to create a very high resistance. When the voltage exceeds that level, the electrons behave differently, creating a much lower resistance. When the voltage is correct, an MOV does nothing. When voltage is too high, an MOV can conduct a lot of current to eliminate the extra voltage.

As soon as the extra current is diverted into the MOV and to ground, the voltage in the hot line returns to a normal level, so the MOV's resistance shoots up again. In this way, the MOV only diverts the surge current, while allowing the standard current to continue powering whatever machines are connected to the surge protector. Metaphorically speaking, the MOV acts as a pressure-sensitive valve hat only opens when there is too much pressure.

Battery Backup:

A device which provides power to equipment during the absence of commercial AC with the help of a battery is known battery backup's device. UPS is the poplar battery backup device.

UPS:(**U**ninterruptible **P**ower **S**upply) A device that provides battery backup when the electrical power fails or drops to an unacceptable voltage level. Small UPS systems provide power

for a few minutes; enough to power down the computer in an orderly manner, while larger systems have enough battery for several hours. In mission critical datacenters, UPS systems are used for just a few minutes until electrical generators take over.

UPS systems can be set up to alert file servers to shut down in an orderly manner when an outage has occurred, and the batteries are running out.

UPS generally protects a computer against four different power problems:

• **Voltage Surges and Spikes:** Times when the voltage on the line is greater than it should be

• **Voltage Sags:** Times when the voltage on the line is less than it should be

• **Total Power Failure:** Times when a line goes down or a fuse blows somewhere on the grid or in the building.

• **Frequency Differences:** Times when the power is oscillating at something other than specified.

As shown in the above fig the main parts of a common (standby) UPS are

1. A **Voltage Regulator** consisting of a **Surge Suppressor** and a **Filter**

2. An **Inverter** which is powered by a **Battery** and

3. **A Transfer Switch which** initiates the shift from the mains to the battery in case of a power failure

The Surge Suppressor and the Filter ensure that when the power is drawn from the mains there are no undue fluctuations or spikes passed to the computer, which can harm it. In the event of power failure, computer is moved to battery-supplied power by the Transfer switch. The Inverter converts the DC voltage supplied by the battery into AC voltage and ensures that there is a uniform voltage, which is given to the computer.

17) What are the types of UPS?

UPS is available in different types. They are

- Standby UPS
- Inline UPS
- Line interactive UPS
- Intelligent UPS.

A stand by UPS switches circuits from the AC circuit to the battery powered circuit. The following figure shows the standby UPS. The solid line in the picture represents the primary circuit by which electricity flows. The dashed line represents the secondary circuit that is used when the AC current fails. The primary circuit will have surge suppressor and filter. During normal operation a small amount of current flows to the secondary circuit to keep battery charged. When the AC power fails, the UPS switches from the primary to the secondary circuit and the battery provides the power, which is converted from DC to AC before it leaves the UPS.

The switching time is problem with this type of UPS.

The inline UPS: As shown in the following figure inline UPS uses battery powered circuit as the primary circuit, instead of using AC circuit.

With inline UPSs, when the AC current fails, no switching is needed because the primary circuit continues to be the battery powered circuit. The only thing that is lost is the battery recharging. These UPSs are sometimes called true UPSs, because they truly provide uninterrupted power.

Because the inline UPS converts the AC power to battery power in DC and then back to AC power, the inline design is sometimes called as double conversion.

Line Interactive UPS:

The line interactive UPS is a variation of the stand by UPS that shortens the switching time by always keeping the inverter working, so there is no charging-up time for the inverter. An inverter is a device that converts DC to AC. However, during regular operation, the inverter filters electricity and charges the battery by converting AC to DC. If the power fails, the switch

breaks the normal circuit and inverter switches roles and begins to convert the battery's DC to AC. The delay for the inverter to switch role is shorter than the delay for a standby UPS that must start up the inverter.

Intelligent UPS:

Some UPS can be controlled by software from a computer for additional functionality. This type of UPS will have serial port connection to the PC and microprocessor on board.

This type of UPS can perform the following

- Diagnose the UPS
- Check for a weak battery
- Monitor the quality of electricity received
- Monitors the load
- Automatically schedule the weak battery test.
- Send an alarm to workstations on network to prepare for shutdown.
- Protect the servers during the blackout of UPS

Windows NT and Windows 2000 offer support for intelligent UPS.

==========End of unit-3==========

======By Prof. Adarsh Anand (G.P Purnea)======