

CHM (MODEL ANSWER)1st INTERNAL 5th CSE DIPLOMA

Q.1.(a) Primary memory is the main memory of the computer which can be directly accessed by the central processing unit, whereas secondary memory refers to the external storage device which can be used to store data or information permanently.

(b) Memory access time is how long it takes for a character in RAM to be transferred to or from the CPU. Fast RAM chips have an access time of 10 nanoseconds (ns) or less. Disk access time is always given as an average, because seek time and latency vary depending on the current position of the head and platter.

Memory Speed: The amount of time that it takes RAM to receive a request from the processor and then read or write data. Generally, the faster the RAM, the faster the processing speed. RAM speed is measured in Megahertz (MHz), millions of cycles per second so that it can be compared to your processor's clock speed.

(c) A file system defines how files are named, stored, and retrieved from a storage device. Every time you open a file on your computer or smart device, your operating system uses its file system internally to load it from the storage device.

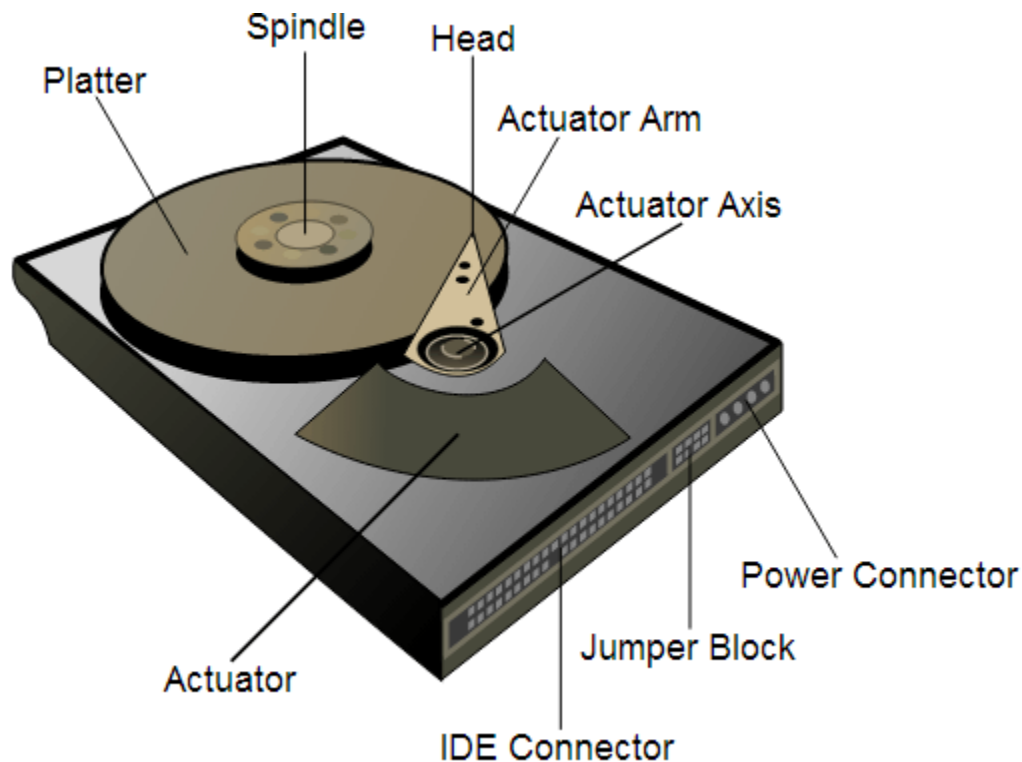
(d) A display is a computer output surface and projecting mechanism that shows text and often graphic images to the computer user, using a cathode ray tube (CRT), liquid crystal display (LCD), light-emitting diode, gas plasma, or other image projection technology.

There are several types of displays some are as follows:

1. Cathode Ray Tube (CRT) Monitors. It is a technology used in early monitors.
2. Flat Panel Monitors. These types of monitors are lightweight and take less space.
3. Touch Screen Monitors.
4. LED Monitors.
5. OLED Monitors.
6. DLP Monitors.
7. TFT Monitors.
8. Plasma Screen Monitors.

Q.2.(a) Hard disks are rigid platters, composed of a substrate and a magnetic medium. The substrate – the platter's base material – must be non-magnetic and capable of being machined to a smooth finish. It is made either of aluminum alloy or a mixture of glass and ceramic. To allow data storage, both sides of each platter are coated with a magnetic medium – formerly magnetic oxide, but now, almost exclusively, a layer of metal called a thin-film medium. This stores data in magnetic patterns, with each platter capable of storing a billion or so bits per square inch (bpsi) of platter surface.

Platters vary in size and hard disk drives come in two form factors, 5.25in or 3.5in. The trend is towards glass technology since this has the better heat resistance properties and allows platters to be made thinner than aluminium ones. The inside of a hard disk drive must be kept as dust-free as the factory where it was built. To eliminate internal contamination, air pressure is equalised via special filters and the platters are hermetically sealed in a case with the interior kept in a partial vacuum. This sealed chamber is often referred to as the head disk assembly (HDA).



Actually, the files on the hard drive are all scattered on the platter in **sectors** and **tracks**. (Tracks are concentric circles, and the pie-shaped wedges present on each track are called sectors.) Also, the data flow control from and into the Hard Drive is controlled by the operating system.

It decides how the components have to move within the drive to perform a specific operation and relies on the disk controller to implement it by controlling the hardware.

Initially, the operating system based on its analysis over the hard drives **File Allocation Table (FAT)** communicates with the disk controller.

The read (or) write head present on the arm has to move onto different sectors to check for required files or areas available for storage.

And this movement of the arm is taken care of by the **disk controller** based on the instructions the operating system provides it. All of the information is then stored or written magnetically.

For instance, if the computer plans to read information present in the hard drive, it considers the magnetic polarities on the platter. These magnetic polarities are interpreted as 1's and 0's and read by the computer.

(b) A keyboard is one of the primary input devices that allows users to input text into a computer or any other electronic machinery. It is a peripheral device that is the most basic way for the user to communicate with a computer. It consists of multiple buttons, which create numbers, symbols, and letters, and special keys like the Windows and Alt key, including performing other functions. The design of the keyboard comes from the typewriter keyboards, and numbers and letters are arranged on the keyboard in that way, which helps to type quickly.

The above keyboard design is called QWERTY design because of its first six letters across in the upper-left-hand corner of the keyboard. Although the keyboard design is derived from the typewrites, nowadays, it also includes many other keys as well as Alt/Option, Control, and Windows key can be used as shortcuts to perform the particular operation by combination with other keys. For example, if you press Control + S while working on a document in Microsoft Word, it will save the document you are working on. Furthermore, most of the keyboards have function keys (F1 to F12 or F16) at the top of the keyboard and arranged arrow keys in the downside used to perform numerous functions.

Types of keyboards

Most computer users use the standard keyboard, which connects to the computer. Although there are many types of a computer keyboard, such are as follows:

1. Flexible keyboard: It is a type of keyboard that is made of soft silicone with highly portable. It is water and dust-resistant and does not require constant cleaning. It acts the same as a standard keyboard and connects to the computer via a USB connection serial port. These types of keyboards can also be more durable in terms of some ways, as compared to a traditional keyboard.

2. Ergonomic Keyboard: This type of keyboard is beneficial for your body posture. Instead of adjusting yourself to fit the keyboard, it is designed to fit you easily, ease of use, and reduce strain. It is designed in that way; instead of bending their hands, it allows users to straight their hands.

3. Wireless Keyboard: It is a computer keyboard that is connected to computers, laptops, or tablets without any cables. It uses radio frequency (RF), infrared (IR), or Bluetooth technology to connect with devices.

4. Mechanical Keyboard: It is made with high quality that commonly used in both home and office. It is designed for long life with high durability and responsiveness.

5. Virtual Keyboard: It is a software-based keyboard that enables users to type without the need for physical keys. It is an alternative for a physical keyboard or a digital representation of a QWERTY keyboard. \

6. Projection Keyboard: It is a form of computer input device that can be connected via Bluetooth to the mini-PC, tablet computer, or even smartphone.

7. Gaming Keyboard: A keyboard that contains a few specific keys used for gamers is known as a gaming keyboard. The W, S, D, A, and arrow keys are widely used for games on the standard QWERTY keyboard.

(c) LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation. LEDs have a large and varying set of use cases for consumers and

businesses, as they can be commonly found in smartphones, televisions, computer monitors and instrument panels.

LCDs were a big leap in terms of the technology they replaced, which include light-emitting diode (LED) and gas-plasma displays. LCDs allowed displays to be much thinner than cathode ray tube (CRT) technology. LCDs consume much less power than LED and gas-display displays because they work on the principle of blocking light rather than emitting it. Where an LED emits light, the liquid crystals in an LCD produces an image using a backlight.

As LCDs have replaced older display technologies, LCDs have begun being replaced by new display technologies such as OLEDs

How LCDs work

A display is made up of millions of pixels. The quality of a display commonly refers to the number of pixels; for example, a 4K display is made up of 3840 x2160 or 4096x2160 pixels. A pixel is made up of three subpixels; a red, blue and green—commonly called RGB. When the subpixels in a pixel change color combinations, a different color can be produced. With all the pixels on a display working together, the display can make millions of different colors. When the pixels are rapidly switched on and off, a picture is created.

Types of LCDs

Types of LCDs include:

- Twisted Nematic (TN)- which are inexpensive while having high response times. However, TN displays have low contrast ratios, viewing angles and color contrasts.
- In Panel Switching displays (IPS Panels)- which boast much better contrast ratios, viewing angles and color contrast when compared to TN LCDs.
- Vertical Alignment Panels (VA Panels)- which are seen as a medium quality between TN and IPS displays.
- Advanced Fringe Field Switching (AFFS)- which is a top performer compared IPS displays in color reproduction range.

Q.3.(a) Printers are commonly used output devices that produce a hard copy of document stored in electronic form, i.e they put information from computer on to paper.

There are various kinds of printers available today like Impact printers, Bubble-jet printers, Laser printers, Thermal printers etc.

Impact printers

Impact printers are among the old printing technologies, which make use of inked ribbon to make an imprint on the paper. Impact printers are considered noisy when compared to other printers. The most commonly known impact printers are;

- i. Daisy-Wheel Printers
- ii. Dot-Matrix Printers
- iii. How Daisy-Wheel Printers work

i. Daisy-Wheel Printers

A Daisy-Wheel Printer works on the same principle as ball-head typewriter. The daisy wheel printer consists of a disk made of plastic or metal on which characters stand out along the outer edge. The printer rotates the disk to print a character until the desired letter is facing the paper, after which a hammer called solenoid strikes forcing the character to hit an ink ribbon making a mark of the character on the paper.

Their speed is rated by cps (number of characters per second).

Advantages and Disadvantages

The main disadvantage of this printer is that they make noise when printing and these kind of printers cannot print graphics.

The advantage is that they are not expensive and can produce letter-quality text.

ii. Dot-Matrix Printers

It consists of a print head, sheet guide assembly, platen knob, and covers.

The name Dot-Matrix refers to the mechanism the printer uses to print characters on paper i.e., dots.

In this type of printer, it consists of a column of pins on the printhead that form letters and numbers as the printhead moves across the paper. The most recent dot matrix printers are equipped with 24 pins

Solid-Ink Printers

Solid-Ink printers use ink in a waxy solid form than liquid form which avoids problems like spillage. And these kinds of printers print one line at a time and these printers are best suitable for graphic companies that need true color at a price lower than a color laser printer.

Advantages and Disadvantages

Advantages are good print quality, ease of use and generate less waste and the disadvantages include more power consumption and odour of wax

Solid ink printers are less sensitive to paper thickness and paper fibers. This allows printing on a number of different surfaces including recycled and handmade paper.

Thermal Printers

Thermal printers are of two kinds.

i. Direct Thermal printer

Direct Thermal printer use a heated printhead to burn dots into the surface of special heat-sensitive paper. It is similar to older fax machines. The disadvantage in this is that the paper that is used gets darken early, thus making difficult to read.

ii. Thermal wax-transfer printer

Thermal wax-transfer printers use a heat-sensitive-ribbon instead of heat-sensitive paper. Thermal printhead melts wax-based ink from the ribbon on to the paper. The disadvantages with thermal transfer printers are that the heating and cooling of the print head determines their speed which means that since the printhead is extensively used, it has to be replaced often.

Inkjet Printers

Inkjet printers are those that place extremely small droplets of ink onto paper to create an image. They use a reservoir of aqueous ink, a pump and an ink nozzle to accomplish this. These dots are extremely small and can have different colors combined together to create photo-quality images. They essentially work by shooting ink onto paper. Both inkjet and laser printers are non-impact printers in the sense that they do not have mechanisms that physically touch paper in order to create images. However, unlike laser printers, inkjet printers use aqueous ink that spontaneously colors the paper (unlike toner from laser printers that has to be fused into the paper with a fuser).

Scanner is a device that scans images, printed text, and handwriting etc and converts it to digital form or image. It is so named because the data is converted one line at a time or scanned down the page as the scanning head moves down the page.

Components inside a scanner are the following

i. Glass Plate and Cover

The glass plate is the transparent plate wherein the original is placed so that the scanner can scan it and the cover keeps out stray light that can affect the accuracy of the scan

ii. Scanning head

Scanning head is the most important component because it is the one which does actual scanning. It contains components like

1. Light source and mirror : It is the bright white light that is used to illuminate the original as it is being scanned and which bounces off the original and reflected off several mirrors

2. Stabilizer bar: It is a long stainless steel rod that is securely fastened to the case of the scanner and it provides a smooth ride as the scanner scans down the page

3. CCD (Charge Coupled Device) or CIS (Contact Image Sensor) : A CCD array is a device that converts photons into electricity. Any scanner that uses CCD use lens to focus the light coming from the mirrors within the scanning head.

Another technology used in some cheaper scanners is CIS wherein the light source is a set of LEDs that runs the length of the glass plate.

iii. Stepper Motor

The stepper motor in a scanner moves the scan head down the page during scan cycle and this is often located either on the scan head itself or attached to a belt to drive the scanner head.

Flatbed Scanners

The most commonly used scanner is a flatbed scanner also known as desktop scanner. It has a glass plate on which the picture or the document is placed. The scanner head placed beneath the glass plate moves across the picture and the result is a good quality scanned image. For scanning large maps or top sheets wide format flatbed scanners can be used.

Sheetfed Scanners

Sheet fed scanners work on a principle similar to that of a fax machine. In this, the document to be scanned is moved past the scanning head and the digital form of the image is obtained. The disadvantage of this type of scanner is that it can only scan loose sheets and the scanned image can easily become distorted if the document is not handled properly while scanning.

Handheld Scanners

Hand-held scanners although portable, can only scan images up to about four inches wide. They require a very steady hand for moving the scan head over the document. They are useful for scanning small logos or signatures and are virtually of no use for scanning maps and photographs.

(b) **CD:** It is known as Compact Disc. It contains tracks and sectors on its surface to store data. It is made up of polycarbonate plastic and is circular in shape. CD can store data up to 700MB. It is of two types:

1. **CD-R:** It stands for Compact Disc read-only. In this type of CD, once the data is written can not be erased. It is read-only.
2. **CD-RW:** It stands for Compact Disc read Write. In this type of CD, you can easily write or erase data multiple times.

DVD: It is known as Digital Versatile Disc. DVDs are circular flat optical discs used to store data. It comes in two different sizes one is 4.7GB single-layer discs and another one is 8.5GB double-layer discs. DVDs look like CDs but the storage capacity of DVDs is more than as compared to CDs. It is of two types:

1. **DVD-R:** It stands for Digital Versatile Disc read-only. In this type of DVD, once the data is written can not be erased. It is read-only. It is generally used to write movies, etc.
2. **DVD-RW:** It stands for Digital Versatile Disc read Write. In this type of DVD, you can easily write or erase data multiple times.

USB FLASH DRIVE:

A USB flash drive is a device used for data storage that includes a flash memory and an integrated Universal Serial Bus (USB) interface. Most USB flash drives are removable and rewritable. Physically, they are small, durable and reliable. The larger their storage space, the faster they tend to operate. USB flash drives are mechanically very robust because there are no moving parts. They derive the power to operate from the device to which they are connected (typically a computer) via the USB port.

A USB flash drive may also be known as a flash drive or USB drive.

SSD: SSD is a non-volatile storage device, which stands for Solid State Drive. SSD stores the data on flash memory chips and maintains the data in a permanent state, even when the power is off.

Sometimes, this storage device is also called as a solid-state disk or solid-state device. As compared to electromechanical drives, SSDs have lower latency and access quickly. These storage devices store the data in the semiconductor cells.

Unlike the HDDs (Hard Disk Drives), SSDs do not have any moving parts. That's why they are called solid-state drives.

Types of SSD

Following are the several types of Solid-State Drive (SSD):

1. mSATA
2. 2
3. PCIe
4. NVMe

(c) The full name of SMPS is **Switch-Mode Power Supply**. SMPS is defined in simple language when the need for electricity comes in the form of a switch. In which electrical energy is converted from one form to another with essential properties called SMPS. This power is used to obtain a regulatory DC input voltage from DC output or uncontrollable AC for power. SMPS is just as complex as any other power supply system. This is a power source used for loading.

SMPS is an important device for a wide variety of electrical and electronic devices. Which provides it with a source of power consumption specifically designed for electronic projects.

AC-DC Converter SMPS Working:

In this type of SMPS, the input supply is AC and in the output, we get DC supply. Rectifiers and filters are used to convert this AC power to DC. This uncontrollable DC voltage is given to the affected power factor correction circuits. This is because there is a low current pulse inside the rectifier around the peak of the voltage.

This includes high-frequency energy which influences to reduce the power factor. This is due to power conversion but we have used AC input instead of DC input supply. Therefore, a

combination of rectifier and filter, this block diagram is used to convert AC to DC, and switching an operation is done using a power muffle amplifier.

MOSFET transistors use low resistance and are capable of resisting high currents. The switching frequency is chosen so that normal humans (above 20KHz) must be kept low and the operation of the switch is controlled using a PWM oscillator.

Again this AC voltage is given to the output of the transformer as shown in the figure or the voltage level goes down. After that, the output of this transformer is fixed and smoothed using the Output filter and corrector. The output voltage is controlled by the reaction circuit compared to the reference voltage.

DC-DC Converter SMPS Working:

The input supply of this power source is taken from the high voltage DC power directly from the DC power source. This high voltage DC power source is then reduced to 15KHz-5KHz. It is then fed to a 50 Hz step-down transformer unit.

The output of this transformer is the input of the rectifier and the output of the rectifier is the power used as the source of loads. The oscillator is controlled on time and a closed-loop regulator is formed.

The switching power supply output is regulated using the pulse width modulation shown in the circuit above, the switch is operated with the help of a PWM oscillator. The power is then indirectly controlled with the help of a step-down transformer when power is supplied to the transformer.

Therefore, the output pulse width is controlled by modulation, as these output voltages and the PWM signal are proportional to each other.

If the duty cycle is 50%, the maximum power is transferred by the transformer, and if the duty cycle is reduced, then the power of the transformer is also reduced by reducing the interruption.

Fly-Back Converter Type SMPS Working:

Any SMPS whose output power is less than 100W is known as a fly-back converter SMPS. Compared to other SMPS, the circuit of these SMPS is simple and straightforward. This type of SMPS is used for low power consumption.

The uncontrolled input voltage of constant intensity is switched to the preferred output voltage by switching using MOSFET; The frequency of switching is around 100 kHz. Voltage isolation is achieved using a transformer. The operation of the switch can be controlled using PWM while operating a practical fly-back converter.

The fly-back transformer shows special characteristics compared to a normal transformer. The fly-back transformer consists of two windings that act as magnetically connected inductors.

The output of this transformer is distributed by capacitors and diodes for the improvement of filtering.

Forward Converter Type SMPS Working:

The design of this type of SMPS is almost the same as the flyback converter type SMS. In such SMPS the switch is connected to the output of the secondary winding of the transformer to control. Compared to a flyback converter, the filtering and correction circuit is more complex. These SMPS are also known as DC-DC buck converters and are also used for scaling and isolation of transformers.

In addition to the D1 “diode and” C “capacitor, an inductor L and diode D are connected at the end of the output. If the ‘S’ switch operates, then the primary winding of the input transformer is turned off. Therefore, a fixed voltage is generated on the transformer-developed secondary winding. So diode D 1 becomes forward biased and the voltage scaled by the load moving LPF passes

When switch S is turned on, the current through the winding reaches zero. The current cannot be changed anytime soon by refreshing filters and loads and this current is offered a lane by diode D2 along the coast. Using a filter inductor, the required voltage and electromagnetic force towards the D2 diode become necessary to influence the stability of the current.

Even if the current is falling against the output voltage, an almost constant output voltage can be maintained with the existence of a large capacitive filter. It is used regularly for various switching applications with a power range from 100 W to 200 W.

A power-on self-test (POST) is a set of routines performed by firmware or software immediately after a computer is powered on, to determine if the hardware is working as expected. The process would proceed further only if the required hardware is working correctly, else the BIOS(Basic Input Output Software) would issue an error message. POST sequence is executed irrespective of the Operating System and is handled by the system BIOS. Once the tests are passed the POST would generally notify the OS with beeps while the number of beeps can vary from system to system. When POST is successfully finalized, bootstrapping is enabled. Bootstrapping starts the initialization of the OS.

The Role of POST in the Boot Sequence

The boot sequence is the process of starting a computer/system. The boot process is initiated when the power button is pressed, it sends power to the boot-loader in the cache memory. The Boot loader performs POST as a preboot sequence and if everything is working well without any errors the BIOS(Basic Input Output System) is activated which finds and loads the operating system.

Finally the software has to interact with the hardware units to complete the process. To avoid any hardware errors while executing a software program, the pre-boot sequence would test the hardware and initiate the OS if and only if the basic hardware units are functioning as expected. he principal duties of the main BIOS during POST are as follows:

1. Find, size, and verify the system main memory.
2. Initialize BIOS.
3. Identify, organize, and select which devices are available for booting.
4. Verify CPU registers.

5. Verify the integrity of the BIOS code itself.
6. Verify some basic components like DMA, timer, interrupt controller.
7. Pass control to other specialized extensions BIOS (if installed).

The checks are performed majorly on:

1. Hardware elements like processor, storage devices and memory.
2. Basic System Devices like keyboard, and other peripheral devices.
3. CPU Registers
4. DMA (Direct Memory Access)
5. Timer
6. Interrupt controller

Types of Errors encountered during POST

If there are any errors in the POST the system would fail to proceed towards the next steps (boot process) as it would throw a fatal error. The POST sequence is executed irrespective of the Operating System. However, how the POST is handled and the types of errors thrown can be modified by the Vendor as per the system requirements.

The error message could consist of text messages on the console or audio in the form of beeps. Irrespective of the vendor there would be a manual describing the types of errors and the error message mappings to help us troubleshoot. The error messages can vary from a parity error to a faulty motherboard.

Troubleshooting steps to resolve errors

The issues can be seen in different ways based on the hardware that is causing the issue. The system might turn on but could be struck before initiating the boot process without any hint/error message or an error message is being displayed on the screen. Follow the steps below to troubleshoot the issue:

1. Analyze when the issue began.
2. Check if any hardware was changed from the last time the system functioned properly.
3. If there was any new hardware try to remove and check to isolate the issue.
4. Remove/Disconnect any disks, USB's and restart the system to check if anything changes.
5. Connect a known working power cable to see if the system is powering on successfully.
6. If you observe any overheating, check if all the fans are functioning well.
7. If you observe any error codes (beep codes, LED indication, Error message on screen) Follow the manual to resolve the issue.

