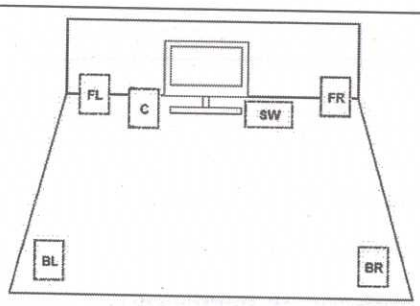
SCHEME OF VALUATION
(Scoring Indicators)

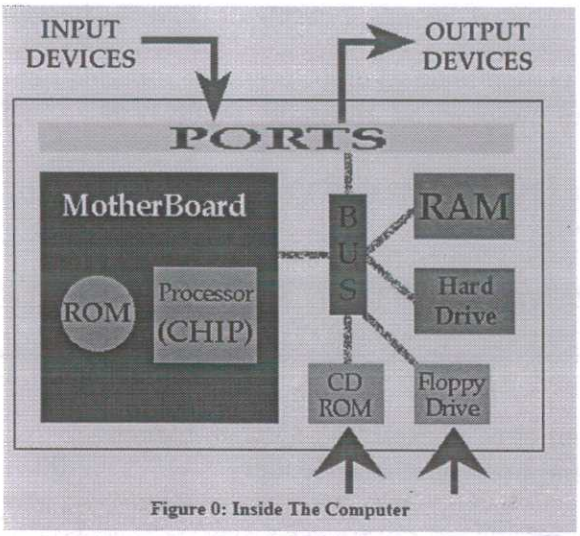
Revision : 15				Course Code : **4131**
Course Title : **COMPUTRE SYSTEM HARDWARE**				
Qst No	Scoring Indicator	Split Up Score	Sub Total	Total
	PART A			
I.1	A major function of the BIOS - power-on self-test. POST routine verifies the integrity of the BIOS itself. verifies and confirms the size of primary memory.	1 1	2	10
I.2	**SCSI** Small Computer System Interface SCSI a set of parallel interface standards for attaching printers, disk drives, scanners and other peripherals to computers.	1 1	2	
I.3	The purpose of adding an expansion card or board to a computer's motherboard is to add or expand some sort of functionality to the computer that it did not have before. Expansion cards are a way to upgrade a computer.	2	2	
I.4	Portable, Laptops use far less energy than desktop, privacy, amount of space required.	Any two (1+ 1)	2	
I.5	It contains ports so that peripherals such as monitors, keyboards, printers, and so on that don't travel with the laptop can remain connected to the dock and don't have to all be physically unplugged each time the laptop is taken away.	2	2	
II. 1	**PART B** The central processing unit, in association with memory, executes a computer program. Central processing unit is to control and direct all the activities of the computer using both external and internal buses. It is a processor chip consisting of an array of millions of transistors. Computer's memory holds data only temporarily, at the time the computer is executing a program. Memory is the part of the computer that holds data and instructions for processing. Before an instruction can be executed, program instructions and data must be placed into memory from an input device or a secondary storage device. The control unit fetches (gets) the instruction from memory. Then decode and execute instructions in CPU.	 2 2 2	6	
II. 2	Basic Input/output System, the BIOS is a ROM chip found on mother boards that allows us to access and set up our computer system at the most basic level. Functions of BIOS (Explanation Needed) POST Bootstrap Loader	2 4 x 1	6	

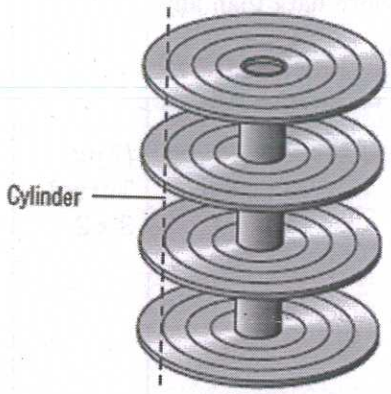
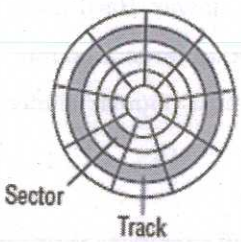
	BIOS drivers BIOS or CMOS Setup			
II. 3	The device in the computer that provides the power to operate is the power supply. A power supply converts 110V or 220V AC current into the DC voltages that a computer needs to operate. These are+3.3VDC, +5VDC, –5VDC (on older systems), +12VDC, and –12VDC. Most computers use a switched-mode power supply. Power supplies used only different types of connectors to power the various devices within the computer: floppy drive power connectors, AT system connectors, and standard peripheral power connectors. ATX power connector, SATA Power Connectors	2 1 3 x 1	6	
II. 4	Partitioning is the process of creating logical divisions on a hard drive. A hard drive can have one or more partitions. Before a hard disk can be formatted, it must have partitions created on it. Formatting is the process of creating and configuring a file allocation table (FAT) and creating the root directory. Several file system types are supported by the various versions of Windows, such as FAT16, FAT32, and NTFS. The FDISK command used to be included with earlier operating systems to make disk partitioning possible. The FORMAT command is used to wipe data off disks and prepare them for new use.	2 2 2	6	
II.5	A home theater personal computer (HTPC) is an all-in-one entertainment system. This personal computer can be easily integrated with the required hardware. The device is capable of performing all the tasks of a standard personal computer as well as providing audio and video playback, recording and other features supported by common household entertainment equipment. A home theater personal computer is also known as a home theater PC or a media center computer. **Hardware Required** • Personnel Computer • AV receiver • 5.1 or 7.1 speaker • Television with remote control	2 2	6	

	 FL = Front Left Speaker FR = Front Right Speaker C = Center SW = Subwoofer BL = Back Left Speaker BR = Back Right Speaker	2		
II. 6	**1. Monochrome** It was the first video technology for PCs. A monochrome computer display is able to display only a single color, often green, amber, red or white, and often also shades of that color. Monochrome Display Adapter (MDA) was the first display adapter developed by IBM. It could display text but not graphics and used a resolution of 720x350 pixels. **2. Color Graphics Adapter (CGA)** It was the first computer color display standard. CGA displays 16-color text in resolutions of 320x200 (40 columns) and 640x200 (80 columns), but it displays 320x200 graphics with only four colors per mode. Each of the six possible modes has 3 fixed colors and a selectable 4th. **3. Enhanced Graphics Adapter (EGA)** EGA produces a display of sixteen simultaneous colors from a palette of sixty-four, at a resolution of up to 640×350 pixels. The EGA card includes a 16 KB ROM to extend the system BIOS for additional graphics functions. **4. Video Graphics Array (VGA)** The VGA technology has a 256KB of video memory on board and could display 16 colors at 640x480, 640x350, and 320x200 pixels or 256 colors at 320x200 pixels. It was the most widely used standard for color PC video. VGA is an analog technology. VGA requires only 3 pins, one each for red, green, and blue. **5. Super VGA** Super VGA (SVGA) is an open standard enhanced video technology developed by Video Electronics Standards Association (VESA). Initially it could support 16 colors at a resolution of 800x600, but soon expanded to support 1024x768 pixels with 256 colors.	Any three (3 x 2)	6	

	6. Extended Graphics Array (XGA) It was developed by IBM. Initially it was available as a Micro Channel Architecture (MCA) expansion board. XGA could support 256 colors at 1024x768 pixels or 65,536 colors at 800x600 pixels. It was also an interlaced technology which means that rather than scanning every line one at a time on each pass to create the image, it scanned every other line on each pass using the phenomenon known as persistence of vision to produce what appears to our eyes as a continuous image.			
II.7	Touchscreen technology converts stimuli of some sort, which are generated by actually touching the screen, to electrical impulses that travel over serial connections to the computer system. These input signals allow for the replacement of the mouse, simultaneously in movement and in click. The two most popular with handheld devices are resistive and capacitive. Capacitive interfaces are generally smoother to the touch than resistive interfaces and can be controlled by the pad of the finger or a special stylus that mimics this soft part of the fingertip. Resistive interfaces usually have to be controlled by the fingernail or a plastic or metal stylus. In any event, the sensory system is added onto a standard monitor at some point. Calibration is required upon first configuration and whenever there appears to be a misinterpretation by the system as to where the user has touched the screen. This technology can also be seen in PDAs and smartphones, point-of-sale venues for such things as PIN entry and signature capture, handheld and bar-mounted games, ATMs, remote controls, appliances, and vehicles.	3 2 1	6	
III. a	**PART C** The spine of the computer is the motherboard, otherwise known as the system board and mainboard. This is the printed circuit board (PCB)—a conductive series of pathways. It is the most important component in the computer because it connects all the other components together. All other components are attached to this circuit board. On the system board, we will find the central processing unit (CPU), underlying circuitry, expansion slots, video components, random access memory (RAM) slots, and a variety of other chips. Many of the following components can be found on a typical motherboard: (Explain Any Six) * Chipsets * Expansion slots and buses * Memory slots and external cache * CPUs and their sockets * Power connectors * Onboard disk drive connectors	2 6 x 1	8	

	* Keyboard connectors * Integrated peripheral ports and headers * BIOS/firmware * CMOS battery * Jumpers and DIP switches * Front-panel connectors			
III. b	**Random Access Memory (RAM) –** • It is also called as read write memory or the main memory or the primary memory. • The programs and data that the CPU requires during execution of a program are stored in this memory. • It is a volatile memory as the data loses when the power is turned off. • RAM is further classified into two types- SRAM (Static Random Access Memory) and DRAM (Dynamic Random Access Memory). **Read Only Memory (ROM) –** • Stores crucial information essential to operate the system, like the program essential to boot the computer.(boot strap loader) • It is not volatile. • Always retains its data. • ROM is further classified into 4 types- ROM, PROM, EPROM, and EEPROM	4 3	7	

IV.a	 Figure 0: Inside The Computer A personal computer (PC) is a computing device made up of many distinct electronic components. system components common to most personal computers, including the following: • Motherboard • Processor • Memory • Basic input/output systems (BIOS) • Input/output Unit and Devices • Storage Medias • Power Supply Unit (Explanation for any six components)	2 6 x 1	8	
IV.b	As the computer's CPU works, it stores data and instructions in the computer's memory. Memory upgrades tend to afford the greatest performance increase as well, up to a point. The most basic model for implementing memory in a computer system uses eight memory chips to form a set. Each memory chip holds millions or billions of bits of information, each in its own *cell*. For every byte in memory, one bit is stored in each of the eight chips. A ninth chip is added to the set to support the parity bit in systems that require it. One or more of these sets, implemented as individual chips or as chips mounted on a memory module, form *memory bank*. • *Parity checking* is a rudimentary error-checking scheme that offers no error correction. • The evolution of memory error detection is known as error-correcting code (*ECC*). If memory supports ECC, check bits are generated and stored with the data. • *Single-sided memory* and *double-sided memory* refer to how some memory modules have chips on one side while others have chips	4	7	

	on both sides. Double-sided memory is essentially treated by the system as two separate memory modules. **Types of Memory** Each one has a particular set of features and characteristics, making it best suited for a particular application. memory types and subtypes: ➢ DRAM • Asynchronous DRAM * FPM DRAM * EDO DRAM * BEDO DRAM • Synchronous DRAM * SDR SDRAM * DDR SDRAM * DDR2 SDRAM * DDR3 SDRAM • DRDRAM ➢ SRAM	3		
V.a	Hard disk drive (HDD) systems (hard disks or *hard drives* for short) are used for permanent storage and quick access. Hard disks typically reside inside the computer, where they are semi permanently mounted with no external access (and can hold more information than other forms of storage. Hard drives use a *magnetic* storage medium. *The hard disk drive system contains three critical components:* **1.Controller :** This component controls the drive. The controller chip controls how the drive operates and how the data is encoded onto the platters. The most common and well-known of these are PATA and SATA. **2.Hard disk** This is the physical storage medium. **Anatomy of a Hard Drive**   components in hard disk are (Explanation needed for each part) * Platters * Read/write heads * Tracks * Sectors * Cylinders * Clusters	5	8	

	Magnetic-drive sectors commonly store only 512 bytes (1/2KB) of data each. **3. Host bus adapter (HBA)** This is the translator, converting signals from the controller to signals the computer can understand. Working Inside the sealed case of the hard drive lie one or more platters, where the actual data is stored by the read/write heads. The heads are mounted on a mechanism that moves them in tandem across both surfaces of all platters.	3		
V. b	**<u>Removable Storage and Media</u>** Removable storage media include tape backup devices, flash memory, SD and other memory cards, USB flash drives and externally attached drives. Many of the removable storage devices are hot swappable. This means that we can insert and remove the device with the system powered on. Most USB-attached devices without a file system fall into this category. **Tape Backup Devices** It is an older form of removable storage. Tape backup devices can be installed internally or externally .It can use either a digital or analog magnetic tape medium instead of disks for storage. They hold much more data than any other medium but are also much slower. Hard disks may fail at some time. So when an enterprise needs to back up large amounts of data on a regular basis, some form of tape media is the most popular choice. Some of the best known tape formats are shown below.	1 (Any Three) 3 x 2	7	

Sequential tape formats

Format Name	Representative Capacity
Quarter-inch Cartridge (QIC)	200KB to 525MB
Digital Linear Tape (DLT)	Up to 160GB
Eight Millimeter (Exabyte)	Up to 800GB
Digital Audio Tape (DAT)/Digital Data Storage (DDS)	Up to 300GB
Linear Tape-Open (LTO)	Up to 1.5TB (12.8TB planned)

Flash Memory

The contents of flash memory can be easily altered by means of electricity. They are normally used as low to mid capacity storage for devices. Flash memory provides a reliable means of storing large

amount of information in a small form factor. They are also used in devices that require a non-volatile means of storing critical data and code often used in booting the device such as routers and switches.

SD and Other Memory Cards

Secure Digital (SD) is a non-volatile memory card format developed by the SD Card Association (SDA) for use in portable devices. It is based on older MultiMediaCard (MMC) format. Typically, they are of size 32mm by 24mm. The SD card is slightly thicker than the MMC and has a write-protect notch. A slightly thinner form of SD called miniSD, has a size of 21.5mm by 20mm. The other, microSD, is thinner yet and only 15mm by 11mm

USB Flash Drives

A USB flash drive, also variously known as a USB drive, USB stick, thumb drive, pen drive, jump drive, flash-disk, or USB memory, [a] is a data storage device that includes flash memory with an integrated USB interface. USB flash drives are typically removable and rewritable, and physically much smaller than an optical disc. They are more durable and reliable compared to CDs and floppy disks because they have no moving parts. Additionally they are immune to electromagnetic interfaces (unlike floppy disks) and surface scratches (unlike CDs). USB drives with USB 2.0 support can store more data and transfer faster than much larger optical disc drives.

A flash drive consists of a small printed circuit board carrying the circuit elements and a USB connector, insulated electrically and protected inside a plastic, metal, or rubberized case. Most flash drives use a standard type-A USB connection allowing connection with a port on a personal computer. USB flash drives draw power from the computer via the USB connection.

USB-Attached External Disk Drives

USB devices that comply with the USB mass storage device class (USB MSC or UMS) specification are recognized as drives by the operating system upon connection, and if the external drive is to be used as a backup location, you simply install any additional software you want to use.

eSATA-Attached External Disk Drives

eSATA is an external drive attachment technology based on SATA. Many enhancements over the SATA physical interface and signal levels are required to accommodate the external environment. A different interface, without the recognizable L-shaped key, had to be specified to avoid accidental or intentional insertion of inadequately shielded internal cables. External power has to be supplied to the drive outside of the 2m or shorter data cable.

VI. a	**RAID** *RAID* stands for *Redundant Array of Independent Disks.* It's a way of combining the storage power of more than one hard disk for a special purpose, such as increased performance or fault tolerance. most commonly used RAID levels: • RAID 0 Also known as *disk striping* • RAID 1 Also known as *disk mirroring,* • RAID 2, which is rarely used in practice, stripes data at the bit (rather than block) level, and uses a Hamming code for error correction. • RAID 3 consists of byte-level striping with a dedicated parity disk. • RAID 4 consists of block-level striping with a dedicated parity disk. • RAID 5 combines the benefits of both RAID 0 and RAID 1, creating a redundant stripe volume set. • RAID 6 extends RAID 5 by adding another parity block; **RAID 1** Also known as *disk mirroring. RAID 1* is a method of producing fault tolerance by writing all data simultaneously to two separate drives. If one drive fails, the other contains all the data and will become the primary drive. However, disk mirroring doesn't help access speed, and the cost is double that of a single drive. If a separate host adapter is used for the second drive, the term *duplexing* is attributed to RAID 1. Only two drives can be used in a RAID 1 array.	Any 4 (4 x 2)	8	
VI. b	Most computers today have an optical storage drive such as Blu-ray Disc (BD), a digital versatile disc—or digital video disc (DVD), or the compact disc (CD) drive. **CD-ROM** The CD-ROM (read-only memory) was designed for long-term storage of data. CD-ROMs are read-only, meaning that information written in the factory can't be erased or changed. CD-ROMs became so popular because they made a great software distribution medium. CD-ROMS have the capacities 650MB, 700MB, 800MB and 900MB. **DVD-ROM** The basic DVD-ROM disc is a single-sided disc that has a single layer of encoded information. These discs have a capacity of 4.7 GB. By adding another media surface on the side of the disc where the label is often applied, a double-sided disc is created with a capacity of 9.4 GB. When the two independent layers are placed on the same side of the disc, it will have a capacity of 8.5 GB rather than the expected 9.4 GB. The loss of capacity is due to the space between tracks on both layers being 10 percent wider than normal to facilitate burning one layer without affecting the other. This results in about 90 percent remaining capacity per layer. This technology is known as DVD DL (DL for dual-layer), attained by placing two media surfaces on the same side of the disc, one on top of the other, and using a more sophisticated mechanism that burns the inner layer without altering the semitransparent outer layer and vice versa, all from the	1 3x2	7	

	same side of the disc. By adding the DL technology to a double-sided disc, you have a disc capable of holding 17.1 GB of information. **BD-ROM** BD-ROM technology was designed for modern high-definition video sources. The equipment used to read the resulting discs employs a violet laser, in contrast to the red laser used with standard DVD and CD technologies. Blu-ray technology further increases the storage capacity of optical media without changing the size. A basic BD has 25GB storage capacity. When you add a second layer to the same or opposite side of the disc, you attain 50GB of storage. The Blu-ray laser is of a shorter wavelength (405nm) than that of DVD (650nm) and CD (780nm) technologies. As a result, and through the use of refined optics, the laser can be focused on a much smaller area of the disc. This leads to a higher density of information being stored in the same area. Blu-ray discs with more than four layers on a side have been demonstrated. **Optical Drive Data Rates** CD-ROM drives are rated in terms of their data transfer speed. The first CD-ROM drives transferred data at the rate of 150KBps, referred to as 1X. CD drives rated as 2X drives would transfer data at 300KBps.The other rates are 8X, 16X, 32X and 52X (theoretical maximum transfer rate) The standard DVD-ROM 1X transfer rate is 1.4MBps. To surpass the transfer rate of a 52X CD-ROM drive, a DVD-ROM drive need only be rated 6X. DVD transfer rates of 16X at the upper end of the scale are common. The 1X transfer rate for Blu-ray is 4.5MBps, roughly 31⁄4 times that of the comparable DVD multiplier and close to 30 times that of the 1X CD transfer rate. written to the same location by a second laser.			
VII. a	**Keyboard** *keyboard* is easily the most popular input device. Using a keyboard, a person can type a document, use keystroke shortcuts, access menus, play games and perform a variety of other tasks. most keyboards use the QWERTY layout, have between 80 and 110 keys, including: • Typing keys • A numeric keypad • Function keys • Control keys Keyboard ports and interfaces Today, most desktop computer keyboards connect to the computer using either USB or Bluetooth for wireless communication. Before USB, a computer may have used PS/2, serial port, or AT (Din5) as a keyboard	5	8	

interface.

Working

Working Principle of a Keyboard:-Inside the keyboard, there are metallic plate, circuit board and processor, which are responsible for transferring information from the keyboard to the computer.

the keys on a keyboard complete individual circuits when each one is pressed. The completion of each circuit leads to a unique scan code that is sent to the keyboard connector on the computer system. The computer uses a keyboard controller chip or function to interpret the code as the corresponding key sequence. The computer then decides what action to take based on the key sequence and what it means to the computer and the active application, including simply displaying the character printed on the key.

Depending upon the working principle, there are two main types of keys, namely, capacitive and hard-contact.

Mouse

A **computer mouse** is a handheld hardware input device that controls a cursor in a GUI and can move and select text, icons, files, and folders. For desktop computers, the mouse is placed on a flat surface such as a mouse pad or a desk and is placed in front of your computer. 3

In its most basic form, the mouse is a hand-fitting device that uses some form of motion-detection mechanism to translate its own physical two-dimensional movement into onscreen cursor motion.
Many variations of the mouse exist, including trackballs, tablets, touchpads, and pointing sticks.

The motion-detection mechanism of the original Apple mouse was a simple ball that protruded from the bottom of the device so that when the bottom was placed against a flat surface that offered a slight amount of friction, the mouse would glide over the surface but the ball would roll, actuating two rollers that mapped the linear movement to a Cartesian plane and transmitted the results to the software interface.
Later technologies used optical receptors to catch LED light reflected from specially made surfaces purchased with the devices and used like a mouse pad. A mouse pad is a special surface to improve mechanical mouse traction while offering very little resistance to the mouse itself. As optical science advanced for the mouse, lasers were used to allow a sharper image to be captured by the mouse and more sensitivity in motion detection.

parts of a computer mouse

Buttons

all computer mice have at least two buttons, a left button and right button

	for clicking and manipulating objects and text. **Ball, Laser, or LED** A desktop mouse may contain a ball and rollers if it is a mechanical mouse or a laser or LED if it is an optical mouse. Each of these components are used to track the movement and move the mouse cursor on the screen. **Mouse wheel** mice also usually include a mouse wheel that allows you to scroll up and down on a page. **Circuit board** To take all the signal information, clicks, and other information being created by the mouse and input it to the computer it must also have a circuit board with integrated circuits. **Cable or wireless receiver** For a corded mouse, it also includes a cable with a plug that connects to the computer. Today, most corded mice connect to the USB port. If your computer has a wireless mouse, it needs a USB wireless receiver to receive the wireless signal and input it into the computer.			
VII. b	**Laser Printers** Laser printers use an electrostatic digital printing process. It is called **electrophotographic (EP) print process.** It uses a laser to scan the image onto a photosensitive drum. This technology uses a combination of static electric charges, laser light, and a black powdery ink-like substance called **toner.** Xerox, Hewlett-Packard and Canon are the main manufacturers of laser printers. **Basic components** **1. Toner Cartridge** Toner is a **black carbon substance** mixed with **polyester resins** to make it flow better and **iron oxide particles** to make it sensitive to electrical Charges. **2. The Laser Scanning Assembly** The laser scanning assembly scans the laser across the photosensitive drum writing the image onto it. **3. High-Voltage Power Supply (HVPS)** The high-voltage power supply (HVPS) provides the high voltages used during the EP process	4	7	

4. DC Power Supply (DCPS)

- The DC power supply (DCPS) converts house current into three voltages: +5VDC and –5VDC for the logic circuitry and +24VDC for the paper-transport motors.

5. Paper-Transport Assembly

The paper-transport assembly is responsible for moving the paper through the printer. It contains different types of rollers,

- **Feed roller, or paper-pickup roller,** when rotates pushes one sheet of paper into the printer.
- **Registration rollers** synchronize the paper movement with the image-formation process in the EP cartridge.

Electronic stepper motor operates the above rollers

6. The Transfer Corona Assembly

When the laser writes the images on the photosensitive drum, the toner then sticks to the exposed areas. The transfer corona assembly is given a High-voltage charge, which is transferred to the paper, which in turn pulls the toner from the photosensitive drum.

7. Fusing Assembly

The paper passes through rollers in the fuser assembly, where temperatures up to 200 °C (392 °F) and pressure are used to permanently bond the plastic powder to the paper. The fuser is made up of three main parts: a halogen heating lamp, Teflon-coated aluminum fusing roller, and a rubberized pressure roller. The fuser uses the halogen lamp to heat the fusing roller to between 329 ° F (165° C) and 392 ° F (200 ° C). As the paper passes between the two rollers, the pressure roller pushes the paper against the fusing roller, which melts the toner into the paper.

8. Printer Controller Circuitry

The **printer controller assembly** converts signals from the computer into signals for the various assemblies in the laser printer, using a process known as rasterizing.

9. Ozone filter

Ozone is a chemically reactive gas that is created by the high-voltage coronas (charging and transfer) inside the printer.

10. Duplexing Assembly

Duplexing assembly which is located inside the printer allows

printing on both sides of the paper.

Working

Electro photographic (EP) Print Process

1. Cleaning
2. Charging
3. Writing (exposing)
4. Developing
5. Transferring
6. Fusing

3

1. Cleaning

A rubber blade inside the EP cartridge scrapes any toner left on the drum into a used toner receptacle inside the EP cartridge, and a fluorescent lamp discharges any remaining charge on the photosensitive drum.

2. Charging

A special wire or roller (called a charging corona) within the EP toner Cartridge (above the photosensitive drum) gets a high voltage from the HVPS. It uses this high voltage to apply a strong, uniform negative charge (around –600VDC) to the surface of the photosensitive drum

3. Writing

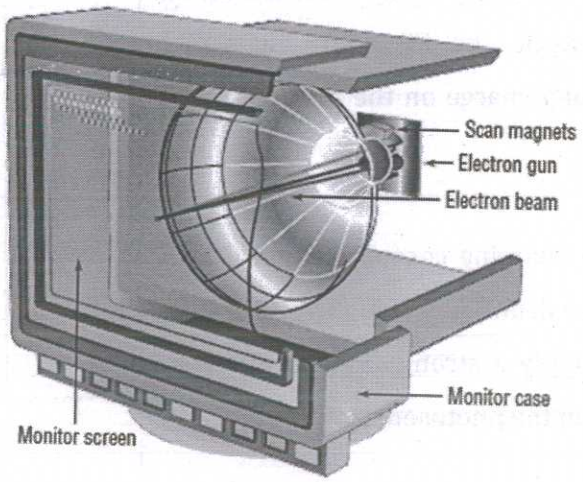
In this step, the laser is turned on and scans the drum from side to side, flashing on and off according to the bits of information the printer controller sends it as it communicates the individual bits of the image. Wherever the laser beam touches, the photosensitive drum's charge is severely reduced from –600VDC to a slight negative charge (around –100VDC).

4. Developing

Now that the surface of the drum holds an electrical representation of the image being printed, its discrete electrical charges need to be converted into something that can be transferred to a piece of paper. The EP process step that accomplishes this is the developing step.

1. Transferring

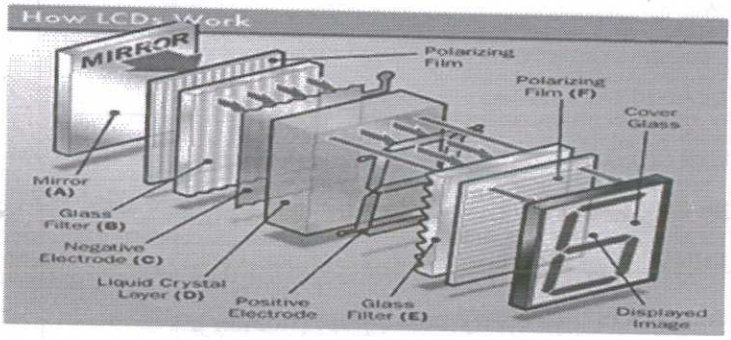
At this point in the EP process, the developed image is rotating into position. The controller notifies the registration rollers that

	the paper should be fed through. The registration rollers move the paper underneath the photosensitive drum, and the process of transferring the image can begin; this is the transferring step. **2. Fusing** In the final step, the fusing step, the toner image is made permanent.			
VIII. a	CRT Displays Cutaway of a CRT monitor  In a CRT, a device called an electron gun shoots a beam of electrons toward the back side of the monitor screen. Color CRTs often use three guns, one each for red, green, and blue image components. The back of the screen is coated with special chemical dots called phosphors that glow when electrons strike them. The beam of electrons scans across the monitor from left to right, as we face it, and top to bottom in a raster pattern to create the image. There are two ways to measure a CRT monitor's image quality: dot pitch and resolution. **Dot pitch** *Dot pitch* is the measurement between the same spot in two vertically adjacent dot trios. **Resolution** *Resolution* is defined by how many software picture elements (pixels) are used to draw the screen. An advantage of higher resolutions is that more information can be displayed in the same screen area. Resolution is a software setting that is common among CRTs,LCDs, and projection systems as well as other display devices. a resolution of 1024 x 768 means 1024 pixels across (columns) and 768 pixels down (rows) were used to draw the pixel matrix - 1024n768 = 786,432 pixels to draw the screen. **Liquid crystal display** Stands for "Liquid Crystal Display." LCD is a flat panel display technology	4	8	

commonly used in TVs and computer monitors. It is also used in screens for mobile devices, such as laptops, tablets, and smartphones. 4

Each pixel of an LCD is made of a thin layer of molecules between two electrodes and two polarizing filters. The basic structure of LCD can be controlled by changing the applied current. The two filters are perpendicular to one another. So only one filter will pass light of a particular polarity. The layer of liquid crystals between the two filters can twist the light so that the polarity changes. This means the light can then pass through both filters, and the pixel appears clear. When giving an electric current to the liquid crystals, the molecules will untwist and will not change the light. The filters then block the light and the pixel appears dark.

There are two types of LCD screens – active matrix screens and passive matrix screens. An active-matrix screen is made up of several independent LCD pixels. A transistor at each pixel location, when switched among various levels, activates two opposing electrodes that align the pixel's crystals and alter the passage of light at that location to produce hundreds or thousands of shades. A passive-matrix display does not have a dedicated transistor for each pixel or sub-pixel but instead a matrix of conductive traces.



The main differences between active matrix and typical passive matrix are image quality and viewing angle. Because the computer takes hundreds of milliseconds to change a pixel in passive-matrix displays (compared with tens of milliseconds or less in active-matrix displays), the response of the screen to rapid changes is poor, causing, for example, an effect known as *submarining*: On a computer with a passive-matrix display, if we move the mouse pointer rapidly from one location to another, it will disappear from the first location and reappear in the new location without appearing anywhere in between. The poor response rate of passive matrix displays also makes them suboptimal for displaying video.

VIII. b	An interface is a method of connecting two dissimilar items together. A peripheral interface is a method of connecting a peripheral to a computer including the specification of cabling, connector and port type, speed and method of communication. The most common interfaces used in today's PCs are • Drive interfaces • SCSI • Parallel • Serial • USB • IEEE 1394 (FireWire) • RJ-45 • Audio (RCA and TOSLINK) • PS/2	1	7	
	Drive interfaces Drive interfaces are used to connect disk drives onto the motherboard. There are two main types - floppy disk drive interfaces and hard disk drive interfaces. Hard disk drive interfaces connect hard disks and optical drives. An interface consists of a circuitry and a port (header). FDD uses a 34 pin connector while HDD uses a 40 pin (80 pins for ATA 5 and higher) connector.	6 x 1		
	Parallel Interfaces The parallel printer interface which is the most common parallel interface transfers data 8 bits at a time over eight separate transmission wires inside a parallel cable (1 bit per wire). Normal parallel interface use a DB25 female connector. Parallel ports are faster than the original serial ports. Bidirectional Parallel Ports can both transmit and receive data. They are used with external CD-ROM drives and external parallel port backup drives (Zip and tape drives).			
	Serial Interfaces In serial interfaces, bits of data are sent one after another. Three main types of serial interfaces are standard serial (RS-232), Universal Serial Bus (USB), and FireWire (IEEE 1394). Standard Serial ports are either DE9 or DB25 male ports. They have a	-		

maximum data transmission speed of 57Kbps and a maximum cable length of 50 feet.

Universal Serial Bus (USB)

They are used to connect keyboards, mice, digital cameras, printers, and scanners. They are Plug and Play.

FireWire (IEEE1394)

FireWire provides speed and efficiency. FireWire 400 (IEEE1394), has a maximum data throughput of 400Mbps and works in half duplex. FireWire 800 (IEEE1394b) has a maximum data throughput of 800Mbps and works in full duplex.

RCA

The RCA cable is a simple coaxial cable. There are two connectors, usually male, one on each end of the cable. There are two contacts on each connector, the ground ring and the positive data pin in the middle. The male connector connects to the female connector on the equipment.

PS/2 (Keyboard and Mouse)

There are two main types of keyboard connectors. They are AT and PS/2 connectors (nowadays they are replaced by USB connectors). The AT connector is round, about 1/2 g in diameter, in a 5-pin DIN configuration.

Video Display

There are mainly five specifications for display devices. They are

1. DVI } Digital
2. HDMI }
3. Component Video }
4. S-Video } Analog
5. Composite Video }

HDMI

High-Definition Multimedia Interface (HDMI) is a digital technology that provides higher motion picture frame rates and digital audio at the same conductor.

DisplayPort

Display Port is a royalty-free digital display interface from the Video Electronics Standards Association (VESA) that uses less power than other digital interfaces and VGA.

IX. a	**Features of Mobile Devices** 1. Size and Dimensions : They are smaller in size and light weight compared to laptops. Their screen sizes are normally 5 inches, 7 inches, 11 and 12 inches at a maximum. 2. Hardware Parts 3-in-1 card slots, USB slots, Wi-Fi card, Ethernet port and webcam, physical or onscreen keyboard for entering information etc 3. Operating System : Android is most popular mobile OS, besides ios, Symbian, Applie ios, Winows OS etc. 4. Storage and RAM : for Storage - Device Memory and External SD card 5. Battery Life : A battery that powers the device for several hours 6. Computing Power : Large processing power needed for playing HD videos, gaming, GPS, music streaming, 4G connectivity etc. 7. WiFi or cellular access to internet, Bluetooth Connectivity 8.Mobile Device Security can be provided by 1. Passcode Locks 2. Remote Wipes and Locators **Additional Capabilities**	4 x 2	8	

	Screen Orientation Most mobile devices can automatically detect their position and use the detected information to reorient the screen to match the orientation of the device. The method of detecting device orientation varies somewhat, but the following two popular methods exist and are presented here with their characteristic detection capabilities: • Accelerometer—forward/backward, left/right, up/down • Gyroscope—roll, pitch, yaw An *accelerometer* measures the acceleration—change in velocity, which is a function of speed and direction—of an object. A *gyroscope* is a sensor that detects rotation around any of three axes, known as roll, pitch, and yaw. **Magnetometer** To detect the position of a device relative to a landmark on the planet, we use a compass. A *magnetometer* allows a device to sense magnetic fields, such as the one our planet exhibits at the magnetic north pole. **Global Positioning System** To detect the absolute position of a device with respect to the manmade latitude and longitude markings on the surface of the earth, triangulation is required. Using three satellites at a fixed distance above the earth's surface, devices with global positioning system (*GPS*) capability can determine their own absolute position. **Touch Screen Technology** two primary technologies used, resistive and capacitive.			
IX. b	**<u>Expansion Buses and Ports in Laptops</u>** - Laptops have expansion ports similar to those found in desktop computers as well as a couple that are found in laptops only. **PCMCIA (PC Card) Expansion Bus** - Personal Computer Memory Card International Association - Was initially used to expand memory PCMCIA 1.0 – 16-bit used for memory expansion only (5V) PCMCIA 2.x – 3.3V - Bus width of these cards is either 16-bit or 32-bit Three major types of PC Cards - Type I cards are 3.3mm thick and are most commonly used for memory cards. - Type II cards are 5mm thick and are mostly used for modems and LAN adapters but for sound cards, SCSI controllers, and other devices as well.	1 3 x 2	7	

- The Type III slot is 10.5mm thick. Its most common application is PC Card hard disks.

ExpressCard

- ExpressCard supports USB 2.0 and PCI Express
- It is capable of transferring data at 2.5 Gbps
- They are capable of accommodating faster technologies
- Supports hot swapping
- 26-pins only (compared to 68-pins) in PCI Card

Mini PCI and Mini PCIe

-Mini PCI is a smaller version of PCI designed for laptops
- 32-bit, 33MHz and uses 3.3V power
- Three types – Type I, Type II and Type III – differ in connector pins and size
- Common Mini PCI devices are sound cards, modems, network cards, SCSI, ATA and SATA controllers.
- Mini PCIe are smaller than ExpressCard
- 52-pin connector
- Suppots USB2.0
- Have 1.5V and 3.3V power options

USB Ports

- Most peripherals for laptops are found as either PC Cards or USB expansion devices
- The USB port is the most common type for portable memory devices known as flash drives.
- External keyboard or keypad is connected through USB ports
- Some laptops come with a combination keyboard/mouse port
- If no USB support exists, this port is used to connect a PS/2 mouse

Communications Ports

- Most laptops are equipped with wireless cards
- may have connections for an analog dial-up modem or an infrared, cellular, Bluetooth, or Ethernet device.

Display

HDMI/VGA Display

X. a	Laptops are designed by considering mainly two challenges : i. laptops are space challenged. ii. Another primary concern is heat. Restricted space means less airflow, meaning parts can heat up and overheat faster. • To overcome space limitations, laptop parts are physically much smaller and lighter, and they must fit into the compact space of a laptop's case. • Also, laptop parts are designed to consume less power and to shut themselves off when not being used • most laptop components are proprietary—the motherboard is especially proprietary, and the LCD screen from one laptop will not necessarily fit on another. <u>Laptop components</u> A laptop combines the components, inputs, outputs, and capabilities of a desktop computer, including the display screen, small speakers, a keyboard, pointing devices (such as a touchpad or trackpad), a processor, and memory into a single unit. Most laptops also have integrated webcams and built-in microphones. Some newer laptops have touchscreens. Laptops can be powered either from an internal battery or by an external power supply from an AC adapter. **Display**—usually an LCD or LED display. **<u>Laptop Motherboards -</u>** have a much smaller form factor, all the components will fit inside the laptop case, nearly always proprietary **<u>Laptop Processors –</u>** • Streamlined connection to the motherboard: Laptop processors are generally either soldered directly to the motherboard or attached using the Micro-FCBGA (Flip Chip Ball Grid Array) standard. • Lower voltages and clock speeds : So heat is reduced and also performance. • Active sleep and shutdown modes :Processor throttling – processor runs in a lower power state when on battery power. **<u>Memory</u>** There are two common types of laptop memory packages 1. Small Outline DIMM (SODIMM) 2. MicroDIMM	2 3 x 2	8	

	Storage
	Nearly all laptops will have a hard drive and an optical drive, but no floppy drive : Reduction in size results in increase in cost.
	Input Devices
	The main challenge in designing input devices for laptops is that they must have low power and small form factor (size) while remaining usable. The main input devices are
	• Keyboards
	• Mice and pointing devices
	  ○ Trackball
	  ○ Touchpad
	  ○ Point stick
	  ○ Touchscreen
	Expansion Buses and Ports
	• PCMCIA (PC Card) Expansion Bus
	• ExpressCard
	• Mini PCI and Mini PCIe
	• USB Ports
	• Mouse/Keyboard Port
	• Communications Ports
	• HDMI, VGA Display Ports			

X.b	**LAPTOP DISASSEMBLY** **Step 1:** Unlock and remove the battery. **To remove the keyboard** **Step 2:** With a small flathead screwdriver push the latches securing the keyboard. **Step 3:** Lift up the keyboard. Turn it upside down and place on the palm rest. **Step 4:** Before you remove the keyboard completely, it's necessary to unlock the connector and release the cable. **Step 5**: Slide the cable retainer about 1-2 millimeters to the shown direction. This will unlock the connector. **Step 6:** Pull the cable **Step 7:** Remove the keyboard from the laptop. **Removing the display panel and the screen** 1. There are two screw covers located in the lower left and right corners of the screen bezel. Remove both covers with a sharp object. Remove both screws. 2. Insert fingers between the bezel and screen and separate the bezel from the display cover. 3. Remove the screws securing the screen to the right hinge bracket.	2 x 3.5	7	

	4. Remove three more screws from the left bracket. 5. Separate the LCD screen from the cover. Now you can access the display cable in the back. 6. Remove sticky tape securing the connection. Unplug the display cable from the screen. 7. Remove the LCD screen completely and replace it with a new one if necessary.			