



**Important Instructions to examiners:**

- 1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
- 2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
- 3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills).
- 4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
- 5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
- 6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
- 7) For programming language papers, credit may be given to any other program based on equivalent concept.

**Q.1.**

**a) Attempt any six of the following:**

**i. Define the terms cache hit and cache miss.(Definition – each 1M)**

**Cache Hit:** Whenever the data needed by processor is found in cache memory it is known as **CACHE HIT**.

**Cache Miss:** Whenever the data needed by processor is not found in the cache it is known as **CACHE MISS** and it leads to delay in the execution because the processor checks in RAM. And if this also fails then it goes to look onto the slower storage device thus making the system slow.

**ii. Give four specifications of blue-ray disk.(For 4 specifications ½M each)**

1. Media type: It is the media used by the disk, which is optical disc –HD.
2. Encoding type : MPEG standards
3. Capacity :25 – 128GB
4. Block size :64KB ECC
5. Read Mechanism or Laser wavelength : 405 nm blue-violet laser diode
6. Disc Dimensions : 120 mm (4.7 in) diameter and 1.2 mm thickness
7. Data transfer rate : 36Mbps

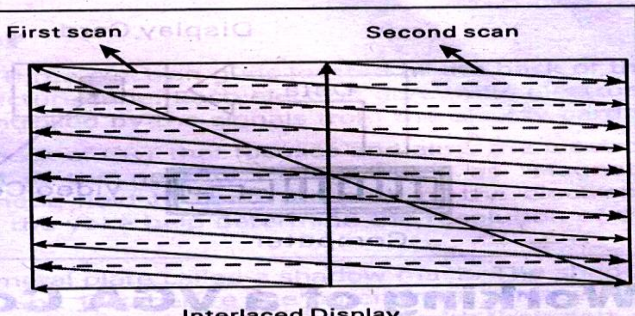
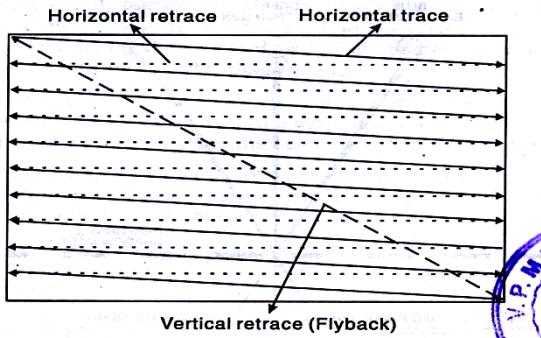
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- iii. State any two differences between interlaced and non-interlaced monitor. (Any two differences –each 1M.)

Interlaced	Non - interlaced
1. Scans every other line of the image in one pass & the remaining lines in other pass	Scans all lines in single pass
2. Difficult on the eyes	easy on the eyes
3. Flicker is more	Flicker is less
4. Effective image refresh rate is half the vertical scanning rate	Entire image is refresh at vertical Scanning rate
5. 	

- iv. State any four printer characteristics. (For any 4 characteristics  $\frac{1}{2}$ M)

- Printer type : Impact or Non-impact, laser or Inkjet
- Resolution : specified in dpi
- Print direction : One directional or Bi directional
- Input Buffer : size in KB or MB
- Printer Speed : in cpm, lpm or ppm
- Interface : Serial or parallel /USB
- Cartridge type

- v. Enlist the types of key switches. (2 marks)

Types of Key switches

- Capacitive
- Hall effect switch
- Opto-electronic
- Membrane
- Mechanical
- Rubber dome switch

- vi. What is 'Power Good Signal'? What is its use? (Definition – 1M; One use – 1M)

- PGS: Power Good Signal – This is a signal generated by the SMPS during booting.  
Uses:
- This is used to check the working of SMPS.
- When all four voltage outputs (+5V, -5V, +12V, -12V) are steady above minimum sense levels for more than 100ms, PGS is generated by SMPS. This can be used to reset the PC during booting.



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**vii. List any four firewire features.(Any 4 features, ½ mark each )**

**Firewire** is a serial interface for different high speed peripherals.

1. Hot pluggability.
2. Multiple devices up to 63.
3. Uses daisy chain topology
4. Data Transfer Rate 400/ 800 Mbps
5. Snap connection: no need for device ID, jumper, DIP switch, terminators etc.
6. Power sourcing.
7. Dynamic reconfiguration.
8. Max distance between devices: 4.5m
9. Supports DMA transfers
10. Well suited for different devices such as Digital Camera, Scanner, HDD, printers, music systems

**viii. State any four Bluetooth features. (Any 4 features, ½ marks each)**

**Bluetooth features:**

1. It can transfer information wirelessly from one enabled device to another.
2. Bluetooth operates in the range of 2400–2483.5 MHz
3. Bluetooth uses a radio technology called frequency-hopping spread spectrum
4. Bluetooth is a packet-based protocol with a master-slave structure.
5. One master may communicate with up to seven slaves in a piconet; all devices share the master's clock.

**b) Attempt any Two of the following:**

- i. **Compare DDR2 and DDR3 with respect to clock frequency, transfer rate, bank used and voltage required.(Each comparison - 1M.)**

Feature	DDR2	DDR3
Clock Frequency	400 MHz and 800 MHz	800 MHz and 1600 MHz
Transfer rate	3200 MB/s. and 6400 MB/s.	6400 MB/s and 12800 MB/s.
Bank used	4 internal banks	8 internal banks
Voltage Required	1.8 Volts	1.5 Volts

- ii. **Describe the construction and working of resistive touch screen display.(Construction- 2M; working – 2M)**

**Construction:**

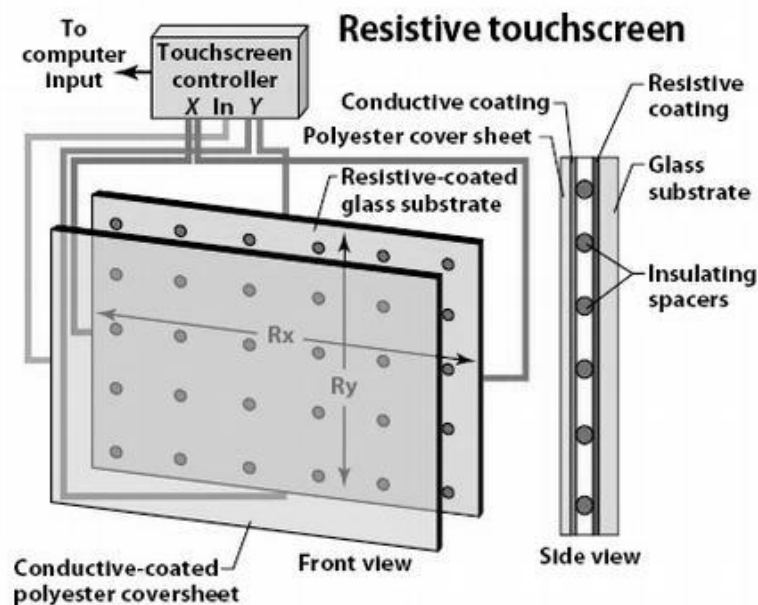
**Note: Any other diagram showing the different layers can be considered.**

A resistive touchscreen panel comprises several layers, the most important of which are two thin, transparent electrically-resistive layers separated by a thin space. These layers face each other with a thin gap between. The top screen (the screen that is touched) has a coating on the underside surface of the screen. Just beneath it is a similar resistive layer on top of its substrate. One layer has conductive connections along its sides, the other along top and bottom.

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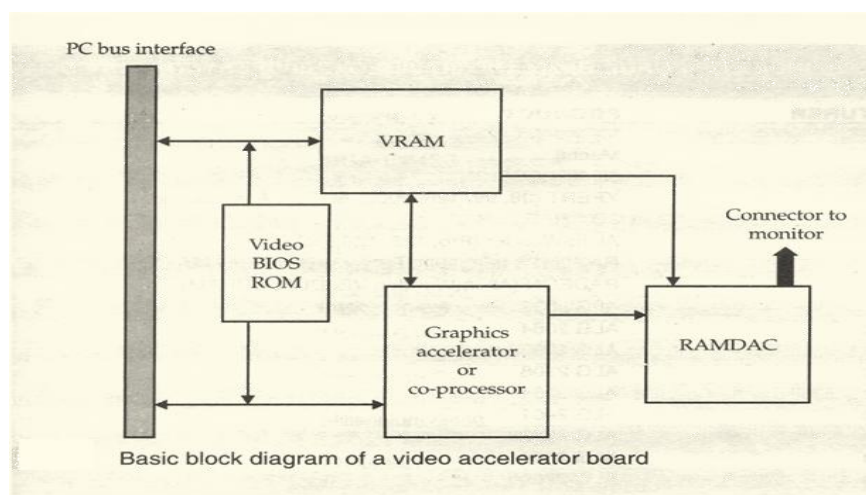


**Working:**

A voltage is applied to one layer, and sensed by the other. When an object, such as a fingertip or stylus tip, presses down onto the outer surface, the two layers touch to become connected at that point: The panel then behaves as a pair of voltage dividers, one axis at a time. By rapidly switching between each layer, the position of a pressure on the screen can be read.

iii. **With neat diagram, describe video accelerator card.(Diagram-2M; description-2M)**

The core of the accelerator is the graphics chip (or Video chipset). The graphics chip connects directly with the PC expansion bus. Graphics command and data are transmitted into pixel data and stored in Video memory offers a second data bus that is routed directly to the Video board's RAM DAC (Random Access Memory Video to Analog Converter). The graphics chip directs RAM DAC operation and ensures that VRAM data is available. The RAM DAC then translates Video data into red, green and horizontal and vertical synchronization signals output signals generated by the monitor. This architecture may appear simple, but this is due to high level of integration provided by the chipsets being used.





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**Q.2. Attempt any FOUR of the following:**

**a) What factors to be considered in the selection of motherboard?(any four)(Any four criteria – each 1M.)**

- **Motherboard Chipset:** Motherboard should use a high performance chipset that supports DDR or DDR2 SDRAM DIMMs. It should also support PCI- Express X16 video support and Serial ATA or faster hard drive support.
- **Processor:** A modern system should use a socket based processor with on-die L2 cache. The processor should have highest speed CPU bus (Front Side Bus: FSB).
- **Processor Sockets:** For maximum upgradability and performance, a socket based system should be used. The main sockets used are Socket A(Socket 426) for Athlon XP and Socket 775 for Pentium 4.
- **Motherboard Speed:** 200MHz to 400MHz for Duron/Athlon/Athlon XP –based boards and 400MHz to 1066MHz for Pentium 4 based boards.
- **Cache Memory:** Use a processor with full core speed on-die L2 cache as it offers maximum in performance.
- **SIMM/DIMM/RIMM memory:** Current systems use either DDR or DDR2 DIMMs. Currently DDR and DDR2 SDRAM and RDRAM are the fastest type of memory available, with RDRAM being by far the most costly.
- **Bus Type:** Current systems offer PCI as well as PCI Express slots. PCI slots should conform with PCI 2.1 or later revision. Systems without on-board video should also feature PCI Express X 16 slot.
- **Basic Input Output System (BIOS):** The motherboard should use industry standard BIOS such as those from AMI, Phoenix or Award. The BIOS should be of a flash ROM or EEPROM design for easy updating.
- **Form Factor:** For maximum flexibility, performance, reliability and ease of use, motherboard with ATX form factor should be used.
- **Built-in Interfaces:** The motherboard should contain as many built-in standard controllers and interfaces as possible.
- **On-board IDE interfaces:** It should be included on the motherboard.
- **Power Management:** The motherboard should support the latest standard for power management which is ACPI.
- **Documentation:** Good technical documentation is essential. It should include information on all jumpers and switches found on the board, connector pin out for all connectors, specifications for other plug-in components etc.
- **Technical Support:** Good online technical support goes beyond documentation. It includes driver and BIOS updates, FAQs, updated tables of processor and memory compatibility, and the utility programs to help you monitor the condition of your system.

**b) With suitable diagram explain zone recording.(Diagram -2M; description -2M)**

➤ Zone bit recording

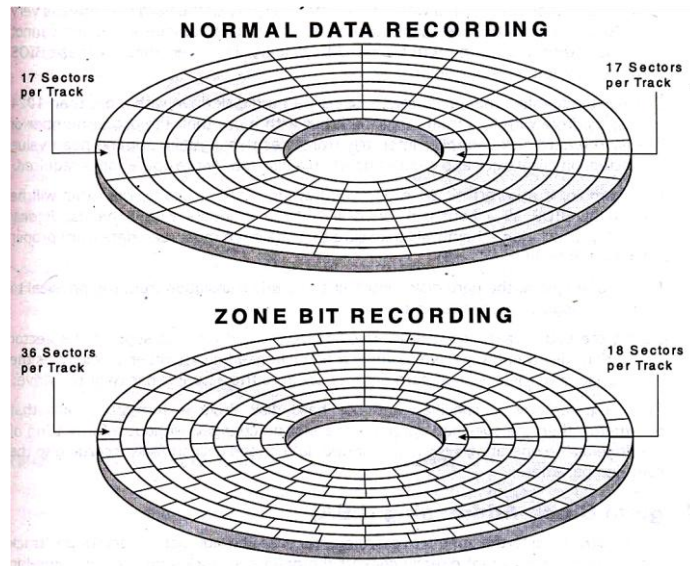
- This is a scheme is used by current high capacity IDE and SCSI HDDs to store more sectors in outer track compared to the number in the inner track.
- In this method, the platter is divided into number of zones, each zone will have a fixed number of sectors / track
- The controller used with the drive has one additional job of converting the odd number of sectors/ track in different tracks into standard no. of sectors/track



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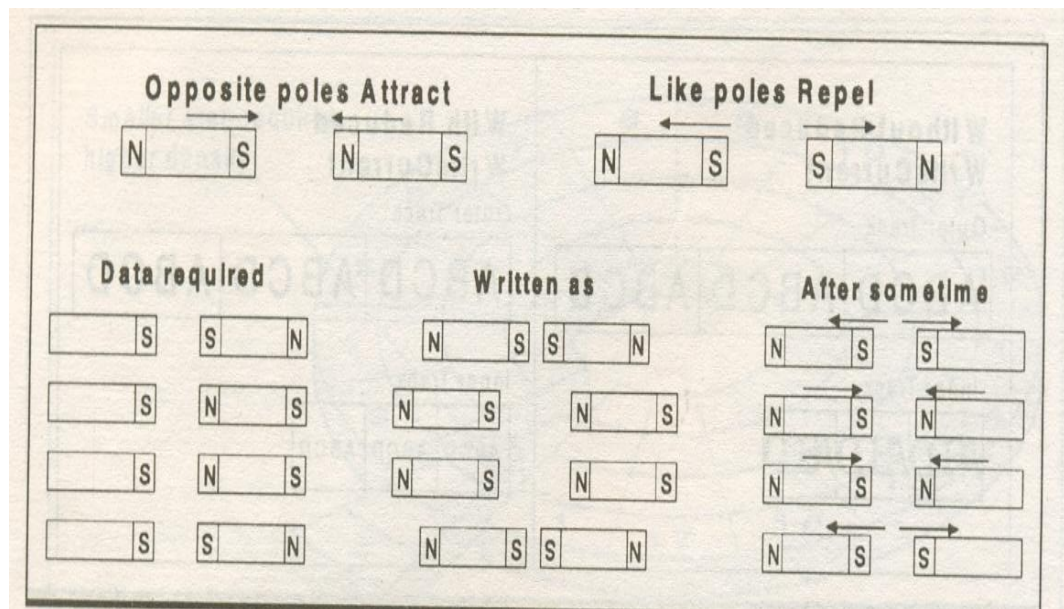
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c) With suitable diagram explain write precompensation. (Diagram 2 M, explanation - 2M)

➤ Write Pre-compensation



- It is useful for drives using standard track, sector format
- Drives using zone bit recording do not require any write pre-compensation
- The magnetic particles used to write on the disk surface have north and south poles
- Like poles repel and unlike poles attract
- In outer surface of hard disk platter, magnetic particles are far apart to be affected by the attraction and repulsion of magnetic particles
- In the inner tracks of the disk drive, the density of the magnetic are very high and adjacent particles start to attract and repel.
- This will force to change the information written on the disk
- To compensate for this shift of data particles due to attraction and repulsion, the drive can write the data apart or closer than the required position

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- The particles will slowly shift to the required position because of attraction and repulsion
- This process of writing the data closer or farther to compensate for attraction or repulsion of magnetic particles is called Write pre-compensation
- The cylinder from which this pre-compensation is started is called pre-compensation cylinder. This value will be used by all the cylinders that are towards the centre of the drive.

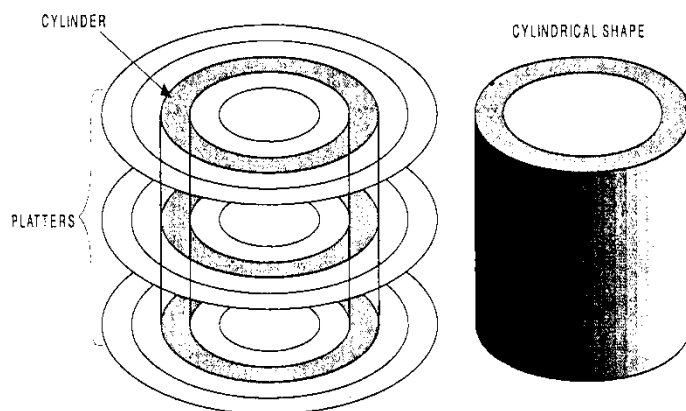
**d) Explain following terms related to hard disk-cluster, cylinder, sector, landing zone.(Each term – 1M.)**

➤ **Cluster**

- When OS writes some information on the hard disk, it does not allocate the space sector wise, instead uses a new unit of storage called “Cluster”
  - Clusters are the minimum space allocated by DOS when storing any information on the disk
  - Even to store only one byte long information on the disk requires minimum one cluster area on the disk surface
  - A cluster can be made up of one or more sectors, it depends on disk type being used.
  - This reduces the size of FAT that DOS uses to keep track of the used and the empty disk space
  - First cluster no. is taken as 2
  - Clusters are used to allocate the storage area for data area only, FAT and directory areas are not allocated according to the cluster size
- Cylinder: (Diagram optional); If given, Diagram- ½M.

➤ **Cylinder**

- Same tracks of different platters form an imaginary cylinder like structure
- Data is stored cylinder by cylinder
- All tracks on a cylinder are written and then the R/W head moves to the next cylinder. This reduces movement of R/W head and increases the speed of read and write operation



➤ **Sector:**

- A track is a big area to store data( 5000 bytes). Hence tracks are divided into sectors
- The formatting program divides disk surface into sectors by writing magnetic pattern on disk surface
- Different HDD capacities have different number of tracks
- 512 byte data can be stored in each sector. Sector no. starts from 1

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➤ **Landing zone:**

- This setting specifies the cylinder to which the BIOS should send the heads of the hard disk when the machine is to be turned off. This is where the heads will "land" when they spin down. Modern drives automatically park the heads in a special area that contains no data when the power is turned off. Therefore this setting is meaningless and is typically ignored.
- Most BIOSes set this value to be the largest cylinder number of the logical geometry specified for the disk when auto detection takes place. So if the drive has 6,136 logical cylinders, the landing zone will be set to 6,135. In any event a modern IDE drive will ignore this setting and auto-park by itself.

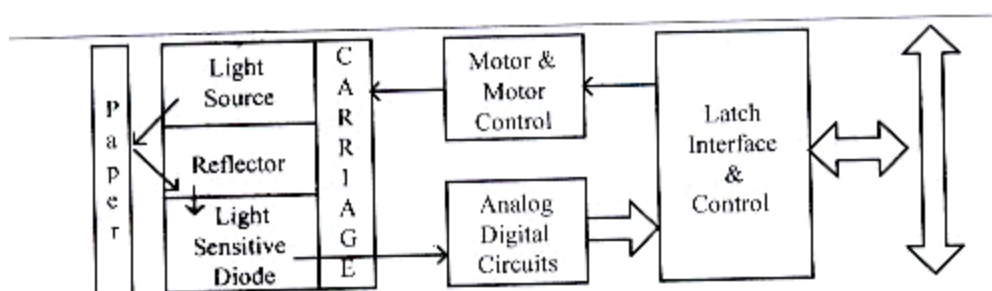
e) **Describe any four characteristics of CRT monitor.(Any four characteristics –each 1M)**

1. **Pixel or picture element:** It is the smallest are of the monitor screen that can be turned on or off to help create an image.
2. **Dot Pitch:** Measurement of how close the holes (in the mask) are to each other. The closer the holes, smaller is the dot pitch and sharper is the image.
3. **Resolution:** Amount of detail a monitor can show. It is expressed in terms of number of horizontal and vertical pixels contained in the screen.
4. **Video Bandwidth:** It is the maximum input frequency that a monitor can handle. It helps in determining the resolution capability of the monitor.
5. **Horizontal Scanning Frequency:** frequency at which monitor redraws the horizontal lines that make up the image.

For VGA monitor – 31.5 KHz For SVGA monitor – 35 to 48 KHz

6. **Vertical Scanning Frequency:** (Vertical Refresh Rate) (Frame Rate) Frequency at which hole screen is redrawn. Higher the refresh rate, lesser will be the flicker.

f) **Explain the working of flat bed scanner with the help of neat diagram.  
(Diagram 2 M, Working 2 M)**



**WORKING OF FLAT BED SCANNER**

- Light Source illuminates a piece of paper placed face down on the glass window above the scanning mechanism.
- Motor moves the scan head beneath the page. As it moves the scan head captures light reflected from individual areas of the page. Reflection takes place through a system of mirrors.
- A lens focuses the beams of light on to light sensitive diodes that translate the amount of light into electrical current.
- The more the reflected light, the more is the voltage of the signal. White spaces reflect more light than black or colored images.
- ADC converts each analog signal of voltage into digital pixel representing the scanned area.



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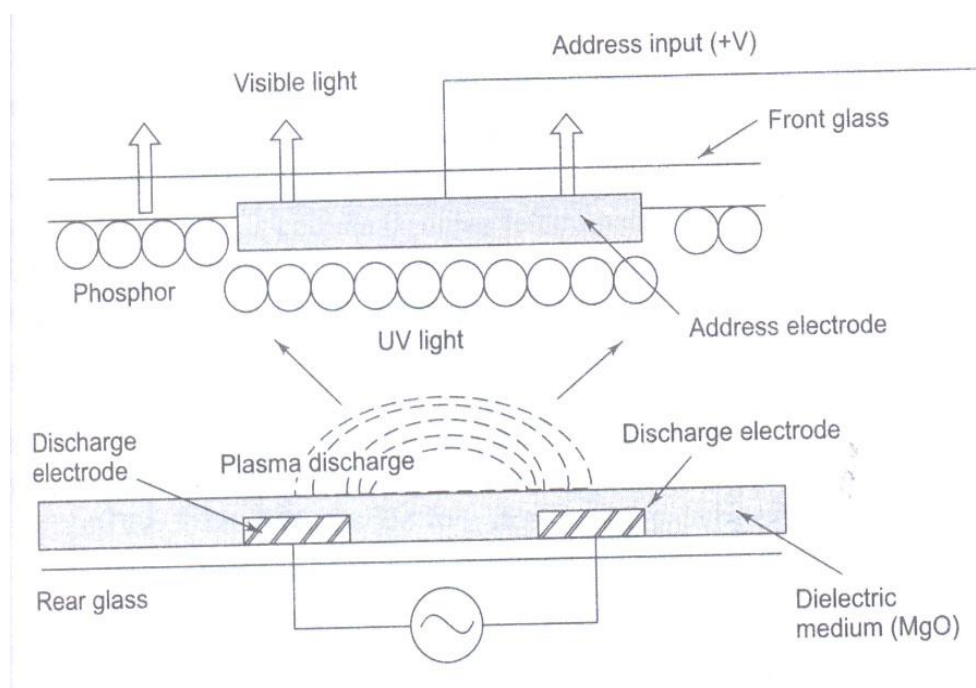
- For monochrome scanner 1 bit per pixel is stored either on or off representing black or white.
- For color scanner, the scan head makes three passes under the images and the light on each pass is directed through a red, green or blue filter before it strikes the original image. Signals from three passes are converted into digital information and stored to represent red, green, or blue color value of the scanned area on the page.
- This digital information is sent to the software in the PC, where data is stored in a format on which a graphics program or OCR can work.

**Q.3. Attempt any four of the following:**

**a) Compare PCI with PCI-express bus. (Any four points 1 mark each)**

PCI	PCI Express
PCI bus operates on bridge architecture	PCI –Express bus operates on hub architecture.
All the PCI devices are connected to a common bus.	Each one of the PCI-Express device connects to the hub over dedicated link.
The data communication in parallel is 32 or 64 bit.	The data communication in serial is X1 to X16 full duplex links
Data transfer rates from 132 Mbytes/s to 528 Mbytes/s.	Data transfer rates from 500 Mbytes/s to 8 Gbytes/s.
PCI uses packet exchange bus topology and requires bus arbitration.	PCI express uses switching network star topology and doesn't require bus arbitration.

**b) Describe the construction and working of plasma display. (Diagram 2 marks, Working 2 marks)**



- Plasma is a state of gas made up of free flowing ions (+ve) and electrons. Under normal conditions a gas is made up of uncharged particles.
- In plasma display xenon and neon atoms are used.
- When an electric current is passed through plasma, the electrons rush towards the positive electrode and ions rush towards the negative electrode.
- During this rush they collide with each other.



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- These collisions excite the gas atoms in the plasma, causing them to release photons of energy.
- These are ultraviolet photons invisible to human eye.
- The released ultraviolet photons interact with phosphor material on the inside wall of the cell and phosphors give off colored light.
- Each phosphor has three separate cells, a red, a blue and a green phosphor.
- These colors blend together to create the overall color of the cell.
- The xenon and neon gas in plasma contain hundreds of thousands of tiny cells positioned between two plates of glass.
- Long electrodes are sandwiched between the glass plates on both the sides of the cells.
- The address electrodes are at the rear glass plate and the discharge electrodes are transparent and mounted along the front glass plate.
- Both sets of electrodes extend across the entire screen.
- To ionize the gas in a particular cell, the electrodes that intersect at that cell are charged.
- When an electric current flows through the gas in the cell, the gas atoms are stimulated and they release ultraviolet photons.
- By varying the pulses of current flowing through the different cells intensity of each sub-pixel color can be varied to create hundreds of different combinations of red, green and blue.

**c) Explain four features of USB. (Any four features 1 mark each)**

- Up to 127 different devices can be connected on a single USB bus.
- Initial USB standard supported 12 Mbps transfer rate. Currently 60 Mbps is supported.
- Supports wide range of peripherals such as keyboard, mouse, printer, FDD, game pad, joystick etc.
- Devices are not daisy chained. Each device is connected to USB hub, which is an intelligent device interacting with the PC on one side and USB peripheral devices on the other side.
- A USB device can be connected without powering off the PC. The plug and play feature in the BIOS together with intelligence in the USB device takes care of detection, device recognition and handling.
- USB controller in the PC detects the presence or absence of USB devices and does power allocation.
- The CPU/software initiates every transaction on the USB bus. Hence the overhead on the PC software increases.

**d) Differentiate between active and passive preventive maintenance with example.  
(Any four differences, 1 M each)**

Active Preventive Maintenance	Passive Preventive Maintenance
Active preventive Maintenance includes procedures that promote longer, trouble free life for the PC.	Passive preventive maintenance includes precautionary steps you can take to protect a system from the environment.
This type of maintenance involves the periodic cleaning of the system and its components, as well as performing back ups, antivirus and antispyware scans and software related procedures	This type of maintenance involves the protection of the system from the environment, such as using power-protection devices; ensuring a clean, temperature-controlled environment; and preventing excessive vibration.

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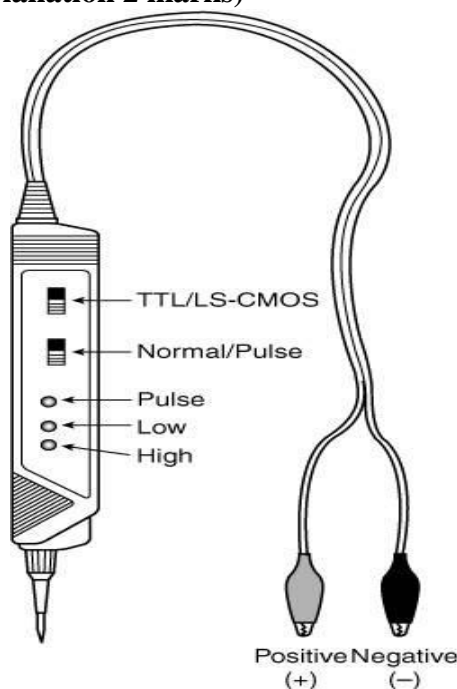
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<p>It involves</p> <ul style="list-style-type: none"> <li>• Cleaning and lubricating components</li> <li>• Reseating chips</li> <li>• Maintaining Hard Disk</li> <li>• Backing-up Data</li> </ul>	<p>It involves</p> <ul style="list-style-type: none"> <li>• Protection from physical environment</li> <li>• Protection from electrical environment</li> </ul>
<p>For e.g. taking back up of important data, Deleting temporary files, Installing antivirus software, Running defragmentation program</p>	<p>For e.g. Using power protection devices, ensuring clean temperature controlled environment, preventing excessive vibrations</p>

e) **Draw and explain the use of logic probe.**

**(Diagram 2 marks, Explanation 2 marks)**



- It is a hand held low cost test equipment with which nearly ninety percent of the faults can be diagnosed without the use of oscilloscope.
- It is used to find the logic state of any node in a circuit including steady states and pulses.
- The logic probe is a small device with a sampling tip, and a number of LEDs that indicate the state of the signal connected to the sampling tip.
- Two "direct" LEDs show whether the signal is high (red LED), low (green LED), off unconnected (no LED).
- If the signal switches quickly between the two states, both LEDs seem to be on continuously (although they aren't).
- A pulse logic detects transition to a state (HIGH or LOW) and generates a 0.5sec pulse lighting up separate "pulse" LEDs.
- A state change can be detected, even if it is only a short pulse invisible on the direct LEDs.
- Additionally a second signal input can be used to latch the main signal at a low-high or low-high transition of the latch input

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**f) Give the meaning of following POST beep codes- (1 mark each)**

- i. 1 short beep
- ii. No beep
- iii. Continuous beep
- iv. 2 short beeps

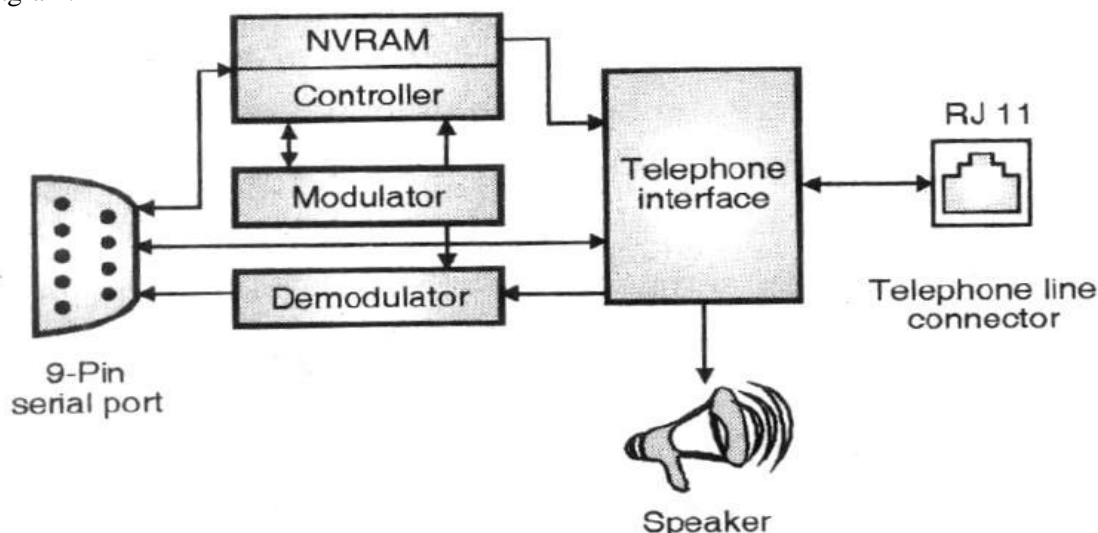
(Answer is as per IBM POST beep codes. Any other correct answer may also be considered)

POST beep Codes	Meaning
1 short beep	Normal POST system is OK
No beep	Fuse blown, Power supply, system board problem, disconnected CPU, or disconnected speaker
Continuous beep	Improper output voltages from SMPS, Power supply, system board, or may be RAM problem, keyboard problem
2 short beeps	POST error – error code shown on screen

**Q.4. Attempt any four of the following:**

**a) What is modem? Explain working of external modem with suitable diagram. modem.(Definition – ½ Marks Diagram – 2 Marks, Explanation- 1½ Marks)**

Definition: Modem is a device used to convert the analog signals to digital and digital signals to analog.  
Modem is a device used to convert the analog signals to digital and digital signals to analog.  
Diagram:



Explanation:

A modulator Circuit converts the serial data from the computer into audio signals to be transmitted over telephone lines. This modulated audio is then coupled to the telephone line. The signal passes through telephone jack (RJ 11) connector at the rate of the modem to the telephone line.

On the receiver side, signals received from the telephone line must be translated into serial data. The telephone interface separates the received signals and passes them to the demodulator. After demodulation the resulting serial data is passed to UART, which in turn converts the serial bits into parallel words that are placed on the system's data bus.

The telephone interface also generates Dual Tone multi Frequency (DTFM) dialing signals needed to reach a remote modem. When the remote modem dials in, the telephone interface detects the incoming signal and alerts the UART to begin negotiating a connection.



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The telephone interface drives a speaker. During the initial stages of modem operation the speaker is used to hear the dial tone, dialing signals, and audio negotiation between the two modems. Once the connection is established, the speaker is disabled.

The controller circuit manages the overall operation of the modem. It switches the modem between the control and data operating modes. The controller accepts commands from the modulator that allow the modem characteristics and operating parameters to be changed.

In the event of power loss or reset conditions default modem parameters can be loaded from NVRAM. Permanent changes to modem parameters are stored in the NVRAM.

**b) Explain the working of optical mouse. (Working 4 marks)**  
**Working of Optical mouse:**

Modern surface-independent optical mice work by using an optoelectronic sensor (essentially, a tiny low-resolution video camera) to take successive images of the surface on which the mouse operates.

As computing power grew cheaper, it became possible to embed more powerful special-purpose image-processing chips in the mouse itself.

This advance enabled the mouse to detect relative motion on a wide variety of surfaces, translating the movement of the mouse into the movement of the cursor and eliminating the need for a special mouse-pad.

Optical mice capture one thousand successive images or more per second. Depending on how fast the mouse is moving, each image will be offset from the previous one by a fraction of a pixel or as many as several pixels.

Optical mice mathematically process these images using cross correlation to calculate how much each successive image is offset from the previous one.

**c) List and explain power supply characteristics.(any four 1 M each)**

- **Ripple:** also sometimes called AC ripple or simply noise. As the power supply produces DC output from AC input, some amounts of AC component are always present in the DC output. Typically these values are very small in the range of miliVolt.
- **Wattage** the total maximum output power of all the voltages that power supply can provide is called as the wattage rating of the power supply. Typical power ranges from 200 to 500Watts.
- **Regulation:** the ability of power supply to maintain an output voltage within the specified limit under varying of input voltage and output load is called as regulation.
- **Load Regulation:** the ability of power supply to control the output voltage level as the load increases or decreases.
- **Line Regulation:** the ability of power supply to control its output voltage as the level of AC input varies from its minimum acceptable level to maximum acceptable level.

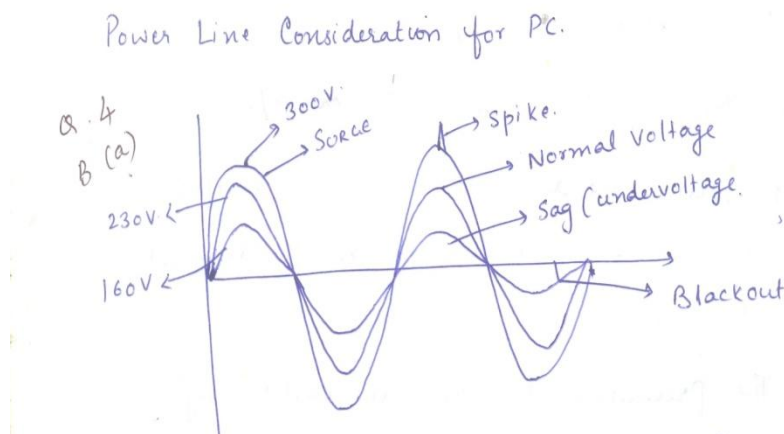
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d) With neat diagram explain

- i. Surge
- ii. Spike
- iii. Blackout
- iv. Brownout



- **Blackout:** It is the complete loss of electrical power where voltage and current drop to a very low value (typically zero). They are caused due to physical interruption in the local network.
- **Brownout:** It is the under voltage condition caused by faulty electrical wiring or excessive electrical load on an AC circuit.
- **Surges:** They are small over voltage conditions that take place over relatively long periods of few milliseconds.
- **Spikes:** It is a large over voltage condition that occurs over short duration of few microseconds.

e) Explain the following RS-232 signals-

- i. TXD
- ii. RXD
- iii. RTS
- iv. CTS

(1 mark each)

- **TXD: Transmit Data:** The serial data leaving the port travels on Transmit data line.
- **RXD: Receive Data:** The bits coming in from a distant serial port go through receive data line.
- **RTS: Request To send:** When the data terminal is on and capable of receiving transmissions, it puts a positive voltage on the request to send line. Absence of RTS signal will prevent the data set from sending out the data.
- **CTS: Clear To Send:** The data set needs to control the signal flow of from the data terminal. The CTS signal indicates to the data set that data can be sent. Absence of CTS signal will prevent the data set from sending out the data.

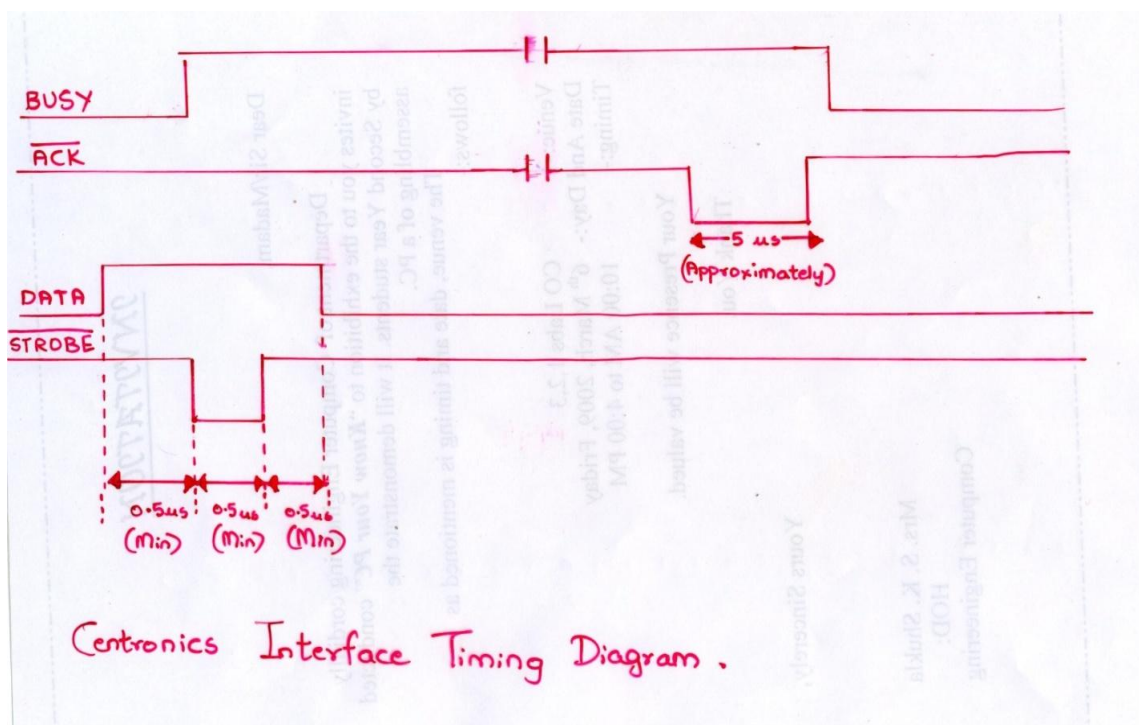


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f) Draw the timing diagram of centronics interface and explain.  
(Diagram 2 marks, Explanation 2 marks)



- The printer controller sends data to the printer.
- After a minimum gap of 0.5 μs, it makes the strobe signal low and keeps it low for a minimum duration of 0.5 μs.
- As soon as strobe signal becomes active low the printer makes the busy line high.
- The controller should retain the data on the data lines for a minimum interval of 0.5 μs from the trailing edge of the strobe signal.
- Thus the data should be kept on the data lines for a minimum duration of 1.5 μs.
- When the printer is ready to receive the next character of data it makes the acknowledge line low.
- When the acknowledge line is made high the printer also removes the busy signal.

Q.5. Attempt any Two of the following:

a) What are the different modes of operation of CPU?

**Processor Modes ( 3 marks for naming different modes of operation of CPU, Explain any 2 modes, for each 2.5 marks)**

Processor modes refer to the various operating environment that affect the instructions and capabilities of the chip. The processor mode controls how the processor sees and manages the system memory and the tasks that use it

**Different Modes of operation**

1. Real Mode (16 bit software)
  2. IA -32 Mode
    - Protected mode (32 bit software)
    - Virtual real mode (16 bit program within 32 bit environment)
  3. IA 32 e – 64 bit extension mode
    - 64 bit mode (64 bit software)
- Compatibility mode



### 1. Real Mode

It is based on 8086 & 8088 processor. The original IBM PC included an 8088 processor that could execute 16 bit instructions using 16 bit internal registers and could address 1 MB using 20 address lines. These 16 bit operating systems and applications are designed to run on original 8088 processor. The 16 bit instruction mode of 8088 is called the **real mode**. All softwares running in the real mode must use only 16 bit instructions and work within 20 bit memory architecture it supports. No multi tasking – no protection is there to keep one program from overwriting another program

### 2. IA 32 mode – Protected Mode

386 is the first 32 bit processor. The chip can run an entirely new 32 bit instruction set (32 bit OS and 32 bit application). This 32 bit mode is the protected mode. It has multi tasking capabilities. It has backward compatibility to run 16 bit OS and applications without any modification

#### IA 32 Mode Virtual Real mode

It is a 16 bit environment that works inside 32 bit protected mode. When DOS prompt is created within windows, virtual real mode is created. Several real mode sessions can be run each having its own software on a virtual PC. They can run along with other 32 bit applications. In virtual real mode, it can access up to 1MB memory. Each virtual machine has a limit of 1MB address space. This mode is an enhancement of the protected mode is normally used to run graphical multitasking operating systems, such as MMX, SSE etc

### 3. IA – 32 e (64 bit Mode )

Registers, Data units, memory addresses integers has 64 bits. CPU with 64bits might have external buses with different size. Supports both external and internal 64 bit support. Operating systems and some software need a change. OS of 64 bit architecture support both 32 bit and 64 bit applications

#### Its features are:

- 64 bit linear memory addressing
- Physical memory support up to 4GB
- 8 new general purpose registers
- 8 new registers for graphic extensions

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Model Answer

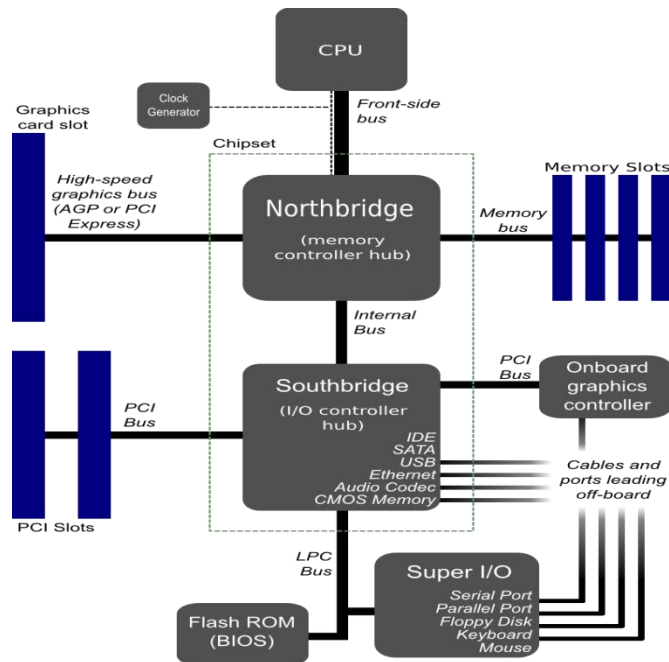
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b) Draw the block diagram of Northbridge/ Southbridge architecture and describe various blocks.

Northbridge / Southbridge architecture–

(Block diagram – 4 marks, Northbridge explanation 2 marks , southbridge explanation -2 marks)- (Any other relevant block diagram may also be drawn)



### Northbridge

- Northbridge is also called Memory Controller Hub (MCH) in Intel Systems. It is one of the two chips in the core logic chipset on the PC motherboard.
- It handles communication between CPU, RAM, AGP or PCI Express and the Southbridge.
- Some North-bridges also have the integrated Video controller called Graphics Memory Controller Hub (GMCH).
- Since different processors and RAM require different signaling, a north-bridge will work with one or two types of CPU and only one type of RAM. It provides the number, Speed, type of CPU, Size, type of RAM that can be used.
- The north-bridge plays an important role in deciding how far a computer can be over-clocked.
- It uses a heat sink and some kind of cooling (Fan).

### South bridge

- The **Southbridge**, also known as the **I/O Controller Hub (ICH)**
- It is a chip that implements the "slower" capabilities of the motherboard in north bridge/south bridge chipset computer architecture.
- It is not directly connected to the CPU. Rather, the northbridge ties the south bridge to the CPU.
- A particular type of south bridge may work with different northbridge chipsets.
- The interface between the northbridge and the south bridge is the PCI bus.

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Model Answer

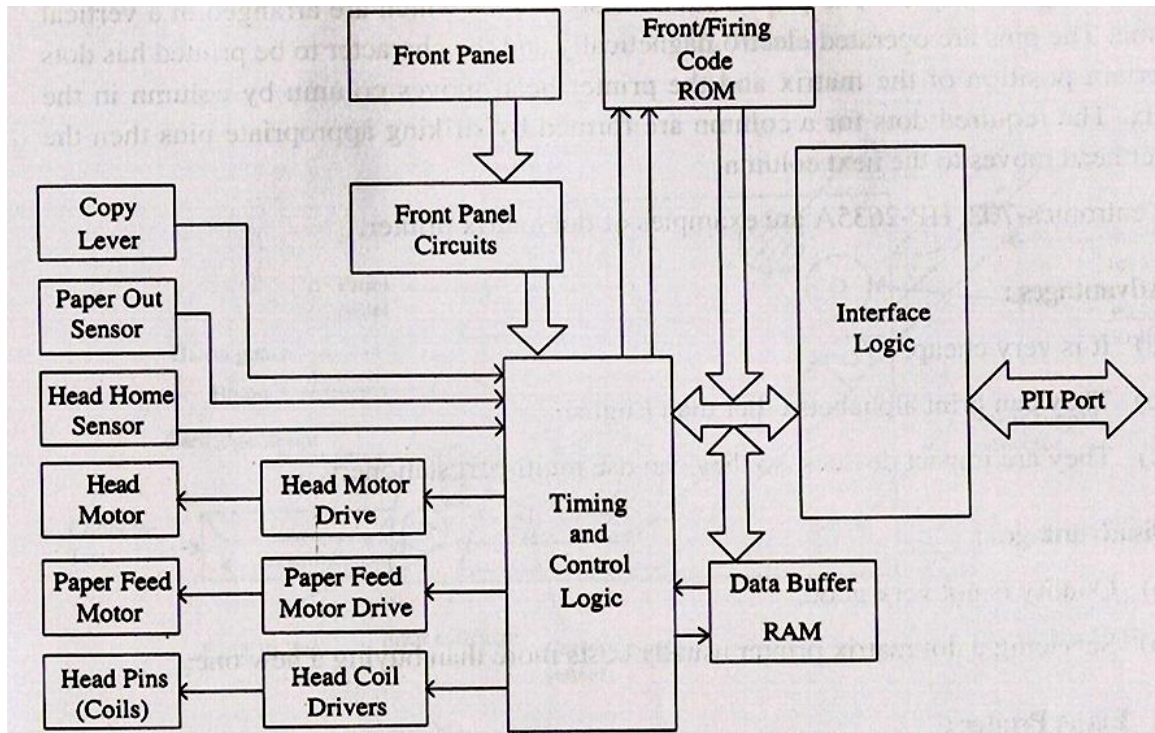
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c) With the block diagram, explain the working of dot matrix printer.

Block diagram – 4marks , working – 4 marks

Principle of operation of Dot-Matrix printer.



**Working:**

- Print head moves horizontally across the paper and the print pin strikes the paper through an inked ribbon.
- Pin's impact is precisely timed so that it strikes the right position in the character matrix at the right time.
- Major factor determining printing speed is the time required between the successive strikes of each print pins. The time needed to retract and reactivate each print pin puts a physical limit on how fast the pins can be fired.
- PC sends series of ASCII codes that represent characters, punctuation marks etc to be printed over serial or parallel cable along with some printer movement information such as tabs, carriage return etc, to control the position of print head and print carriage.
- The ASCII codes are stored in the buffer (RAM) as the printing speed is less than the speed at which the PC sends data to the printer. When the buffer becomes full the printer informs the PC to stop sending further characters until some of the characters in the buffer are printed.
- The controller inside the printer selects a particular dot pattern for the ASCII code received from the PC. The dot pattern is stored in the ROM.
- The selected dot pattern is sent to the print head. Based on this information the print head fires different pins on the print head. The controller also controls the movement of print head and the paper.



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**Q.6. Attempt any Two of the following:**

**a) Describe Modified Frequency Modulation (MFM) and Run Length limited (RLL) techniques of recording with suitable example.**

**(For MFM explanation 2 marks, Waveform or coding 2 marks)**

**(For RLL explanation 2 marks, Waveform or coding 2 marks)**

Three most common encoding methods are:

- FM encoding method
- MFM encoding method
- RLL encoding method

**MFM Encoding Scheme:**

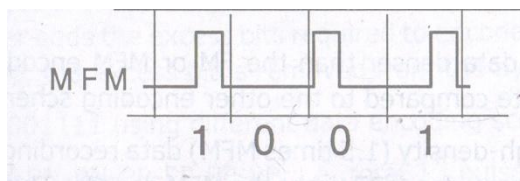
More data can be stored on the same surface or the data storage density can be increased, if the number of pulses required to store the data can be minimized.

When minimizing the pulses, one should be careful that the number of no pulses together should not be very long; otherwise the disk controller may go out of synchronization with the data.

The MFM (modified frequency modulation) method of data storage, by reducing the number of pulses, is able to store more data without any data and synchronization number of pulses, is able to store more data without any data and synchronization loss.

In MFM recording the 0s and 1s are encoded as given below

- 1 is always stored as no pulse, and a pulse(NP)
- 0, when preceded by another 0, is stored as a pulse, and no pulse(PN)
- 0, when preceded by a 1, is stored as two no pulses(NN)
- If you store 1001 on the disk surface using the MFM storage method, it would be stored as NP NN PN NP.



**RLL Encoding Scheme**

The RLL is encoding or the run length limited encoding is the most common encoding scheme used in the hard disk storage. This encoding scheme can be more accurately called as 2,7 RLL encoding because in this scheme in a series or in a running length the minimum number of 0s next to each other is two, and the maximum number of 0s together can not be more than seven.

The RLL encoding scheme can store 50 percent more information than MFM encoding scheme on a given surface and it can store three times as much information as the FM encoding scheme.

The Run length Limited name comes from the minimum number (run Length) and maximum number (run Limit) of “no pulse” values allowed between two pulses.

For the RLL encoding, an encoder/decoder (Endec) table is used to find the pulse signal to be used for different data bit groups.

Endec table used by the IBM to convert bit information to the pulse signal is shown below



Data Bit	Pulse Encoding
10	NPNN
11	PNNN
000	NNNPNN
010	PNNPNN
011	NNPNNN
0010	NNPNPNPN
0011	NNNNPNNN

For example, if you want to encode a byte 100011 to proper RLL pulse signal then the

- Bit 10 can be encoded as NPNN
- Bit 0011 can be encoded as NNNPNNNN

**b) Enlist types of servo techniques. Describe embedded servo technique with diagram.**  
(Types of Servo 3 marks, Diagram of embedded servo 3 marks, Explanation 2 marks)

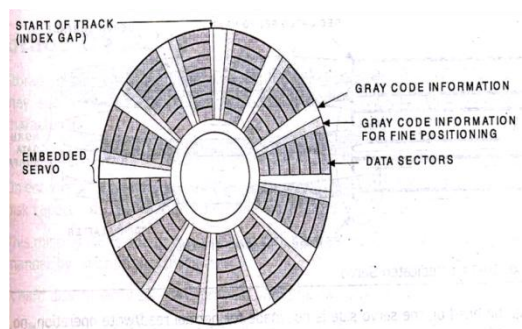
Voice coil based systems use a special information previously written on disk surface (at the time of manufacturing). This special index information on the disk surface is called "Servo".

There are 3 types of servo for controlling the voice coil based head positioning system (relative position of information with respect to the head position)

- Wedge servo
- Embedded servo
- Dedicated servo

**Embedded servo**

- Servo information is kept at the beginning of each sector
- This design allows the head positioning system to receive the current position many times in a single rotation. This makes it precise and faster





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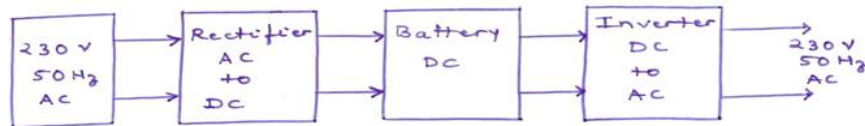
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c) With the help of diagram explain the working of online UPS. Give the advantages of online UPS over offline UPS.

(Block diagram – 3 marks, explanation – 3 marks, Advantages – 2 points – 2 marks)

BLOCK DIAGRAM OF ON-LINE UPS



- It contains a transformer, a rectifier and a filter which convert AC into DC
- This DC is given to the battery charger which charges the battery. The output of the battery is given to the inverter which converts DC to AC and gives it to the PC.
- In this type of UPS the system is supplied power from the batteries continuously.
- Thus the battery charges continuously and it provides DC voltage to the inverter
- The inverter converts DC to 230V, 50Hz AC signal and gives it to the computer.
- As switching is not involved, spikes are not generated.
- It isolates the AC mains from the PC.

**Advantages**

1. Since switching is not involved, it avoids resetting of PC and spike generation.
2. It isolates AC mains from the PC.