



MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION
(Autonomous)
(ISO/IEC - 27001 - 2005 Certified)

SUMMER – 2019 EXAMINATION
MODEL ANSWER

Subject: Computer Hardware & Maintenance

Subject Code: 17428

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. No	Sub Q.N.	Answer	Marking Scheme
1.	a) (i) Ans.	Attempt any <u>SIX</u> of the following: What is BIOS? BIOS is software stored on a small memory chip on the motherboard. The BIOS (Basic Input Output System) provides the processor with the information required to boot the system from a non-volatile storage unit (HDD, FDD, CD or other). It provides the system with the settings and resources that are available on the system BIOS instruct the computer on how to perform a number of basic functions such as booting and keyboard control. BIOS is also used to identify and configure the hardware in a computer such as the hard drive, floppy drive, optical drive, CPU, memory, etc.	12 2M <i>Explanation 2M</i>
	(ii) Ans.	List four recording techniques used in storage devices. 1. FM (Frequency Modulation) 2. MFM(Modified Frequency Modulation) 3. RLL (Run Length Limited). 4. Perpendicular Recording	2M Any four techniques ^{1/2} M each



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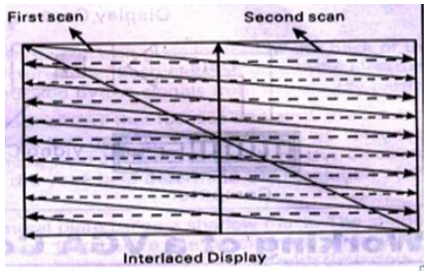
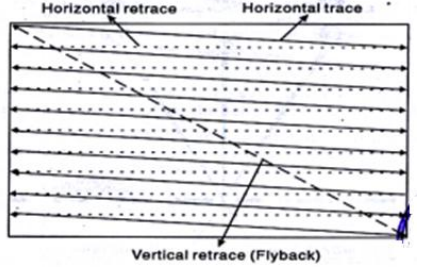
	(iii)	What is dot pitch and frame rate?	2M												
	Ans.	<p>Dot pitch: It is the distance between each group (triad) of red, blue and green phosphors. A smaller dot pitch helps produce sharper and clearer image</p> <p>Frame Rate: This is used to show the number of times a screen full of information is produced per second or the number of times a frame is shown (in one second) on the monitor.</p>	<i>1M each</i>												
	(iv)	Define:	2M												
	Ans.	<p>1) Blackout 2) Surge</p> <p>1) 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.</p> <p>2) Surge: They are small over voltage conditions that take place over relatively long periods of few milliseconds.</p>	<i>Each definition 1M</i>												
	(v)	What is cache memory?	2M												
	Ans.	Cache is a smaller, faster memory which stores copies of the data from the most frequently used main memory locations. When the processor needs to read from or write to a location in a main memory, it first checks whether a copy of that data is in the cache. If so, the processor immediately reads from or writes to the cache, which is much faster than reading from or writing to the main memory. The CPU uses cache memory to store instructions that are repeatedly required to run programs, improving overall system speed.	<i>Explanation 2M</i>												
	(vi)	State any two differences between interlaced and non-Interlaced monitor.	2M												
	Ans.	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; text-align: center;">Interlaced Monitor</th> <th style="width: 50%; text-align: center;">Non-Interlaced Monitor</th> </tr> </thead> <tbody> <tr> <td>1. Scans every other line of the image in one pass & the remaining lines in other pass.</td> <td>1. Scans all lines in single pass.</td> </tr> <tr> <td>2. Difficult on the eyes</td> <td>2. Easy on the eyes</td> </tr> <tr> <td>3. Flicker is more</td> <td>3. Flicker is less</td> </tr> <tr> <td>4. Effective image refresh rate is half the vertical scanning rate.</td> <td>4. Entire image is refresh at vertical scanning rate.</td> </tr> <tr> <td>5.</td> <td>5.</td> </tr> </tbody> </table>	Interlaced Monitor	Non-Interlaced Monitor	1. Scans every other line of the image in one pass & the remaining lines in other pass.	1. Scans all lines in single pass.	2. Difficult on the eyes	2. Easy on the eyes	3. Flicker is more	3. Flicker is less	4. Effective image refresh rate is half the vertical scanning rate.	4. Entire image is refresh at vertical scanning rate.	5.	5.	<i>Any two differences 1M each</i>
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<p>(vii) Ans.</p>	<p>List any two features of SD-RAM. Features of SD-RAM:</p> <ol style="list-style-type: none"> 1. Synchronous dynamic random access memory (SDRAM) is dynamic random access memory (DRAM) that is synchronized with the system bus. 2. It waits for a clock signal before responding to control inputs and is therefore synchronized with the computer's system bus. 3. Any byte of memory can be accessed without touching the preceding bytes. 4. SDRAM is volatile, meaning that they lose their contents when the power is turned off. 	<p>2M</p> <p><i>Any two features 1M each</i></p>	
<p>(viii) Ans.</p>	<p>Write any four advantages of CRT display. Advantages of CRT display:</p> <ol style="list-style-type: none"> 1. Less expensive - Although LCD monitor prices have decreased, comparable CRT displays still cost less. 2. Better color representation - CRT displays have historically represented colors and different gradations of color more accurately than LCD displays. 3. More responsive - Displays full motion video better. 4. Handles multiple resolutions 5. More rugged - Although they are bigger and heavier than LCD displays, CRT displays are also less fragile and harder to damage. (strong glass) 6. CRT monitors have fewer problems with ghosting and blurring because they redraw screen image faster than LCD monitors. 7. CRT monitors are more rugged than LCD monitors. 	<p>2M</p> <p><i>Any four advantages 1/2M each</i></p>	



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1.	<p>b) (i)</p> <p>Ans.</p>	<p>Attempt any <u>TWO</u> of the following: Describe the working of inkjet printer with the help of its block diagram.</p> <div style="text-align: center;"> <p>Functional Block Diagram</p> </div> <p>Working of Inkjet Printer:</p> <ul style="list-style-type: none"> • In Inkjet Printer, we use an ink cartridge with nozzles. • These printers eject ink drops on to the papers through nozzles to form the characters. The ink cartridge has an ink reservoir and a set of nozzles. • It also has a firing chamber. • To start the ink is drawn into the firing chamber. • The thin film resistor at the bottom of the ink drop heats the ink up to 900 degree Fahrenheit for a millionth of a second. • This produces an ink bubble and it rejects the ink out of the firing chamber through nozzle. • The ejected ink drop is deposited on the paper to form a dot. 	<p>8 4M</p> <p style="text-align: right;"><i>Block diagram 2M</i></p> <p style="text-align: right;"><i>Working 2M</i></p>
	<p>(ii) Ans.</p>	<p>State and explain the features of USB. Features of USB:</p> <ol style="list-style-type: none"> 1. Up to 127 different devices can be connected on a single USB bus. 2. Initial USB standard supported 12 Mbps transfer rate. Currently 60 Mbps is supported. 3. Supports wide range of peripherals such as keyboard, mouse, 	<p>4M</p> <p style="text-align: right;"><i>Any four features 1M each</i></p>



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		<p>printer, FDD, game pad, joystick etc.</p> <ol style="list-style-type: none">4. 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.5. 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.6. USB controller in the PC detects the presence or absence of USB devices and does power allocation.7. The CPU/software initiates every transaction on the USB bus. Hence the overhead on the PC software increases.	
	<p>(iii) Ans.</p>	<p>Draw and explain the block diagram of flatbed scanner.</p> <p>The diagram shows a flatbed scanner's internal components. At the top, a 'DOCUMENT ON GLASS BED' is positioned above a 'SCAN HEAD'. The scan head contains a 'LIGHT SOURCE', 'MIRRORS', 'LENS', 'FILTER', and 'CCD' sensor. Below the scan head, a 'STEPPER MOTOR BELT ASSEMBLY' and 'STEPPER MOTOR DRIVER' are shown. The 'CCD' sensor is connected to an 'A-D CONV' (Analog-to-Digital Converter). The 'A-D CONV' is connected to a 'TIMING & CONTROL' unit. The 'TIMING & CONTROL' unit is connected to a 'SYSTEM INTERFACE', which is connected to an 'PC PORT'.</p> <p>Light source illuminates piece of paper face down against glass window above the scanning mechanism. Motor moves the scan head beneath the page. The scan head captures light reflected from individual areas of the page.</p>	<p>4M</p> <p><i>Diagram 2M</i></p> <p><i>Explana tion 2M</i></p>



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		<p>Reflection takes through system of mirrors. Lens focuses the reflected beam of light on light sensitive diodes. The diodes generate electric current corresponding to the amount of reflected light. White spaces reflect maximum light, which generates maximum voltage. ADC converts each analog signal of voltage to digital pixel representing the scanned area. For Monochrome Scanner 1 bit per pixel is stored-either on or off. For Color Scanner, the scan head makes three passes under the images. Reflected light on each pass is directed through red, green and blue filter before it strikes the original image. Signals from the three passes are converted into digital information and stored to represented, 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 OCR can work.</p>																			
2.	a) Ans.	<p>Attempt any <u>FOUR</u> of the following: Compare between the real mode and protected mode of processors (four points).</p> <table border="1"><thead><tr><th>Sr. No.</th><th>Real Mode</th><th>Protected Mode</th></tr></thead><tbody><tr><td>1</td><td>It this mode processor works as 8088/8086</td><td>It this processor works in full capacity</td></tr><tr><td>2</td><td>This mode has only 1 MB memory addressing capacity</td><td>1 MB to few GB</td></tr><tr><td>3</td><td>Handles only one task at a time</td><td>Multiple task at time</td></tr><tr><td>4</td><td>Memory translation not required</td><td>Memory translation required</td></tr><tr><td>5</td><td>Computer can directly communicate with ports and device</td><td>Communicate through OS</td></tr></tbody></table>	Sr. No.	Real Mode	Protected Mode	1	It this mode processor works as 8088/8086	It this processor works in full capacity	2	This mode has only 1 MB memory addressing capacity	1 MB to few GB	3	Handles only one task at a time	Multiple task at time	4	Memory translation not required	Memory translation required	5	Computer can directly communicate with ports and device	Communicate through OS	16 4M <i>Any four points 1M each</i>
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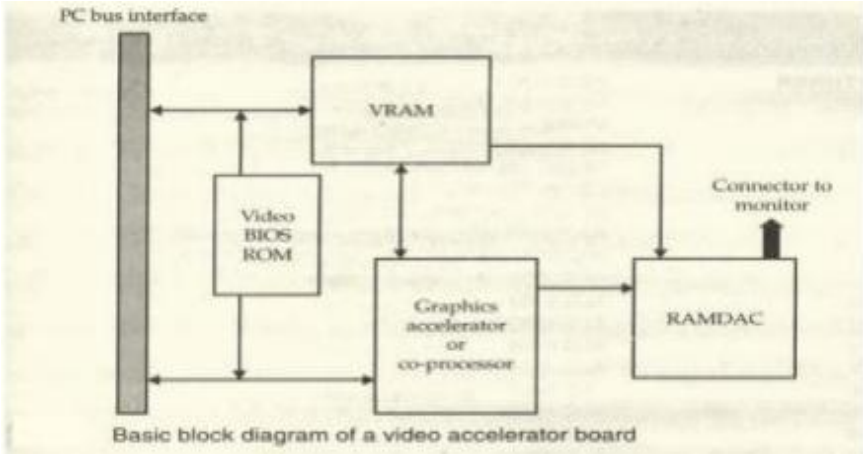
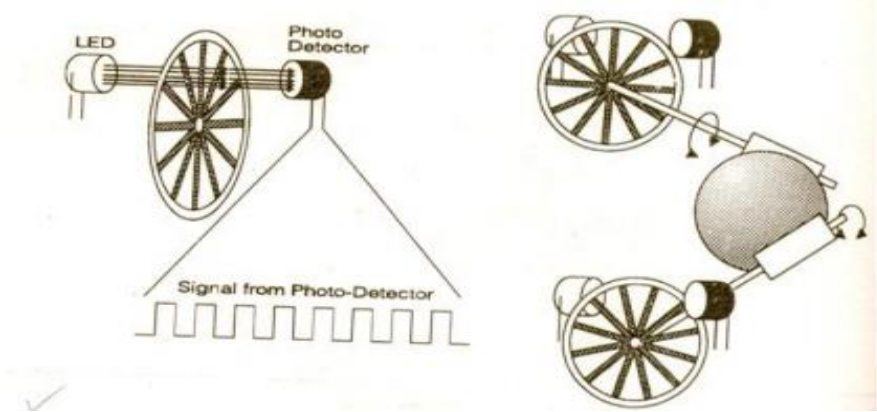
		6	Not support memory management	Support memory management																																																																													
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c) Ans.	<p>Explain video accelerator card with neat diagram.</p> <p>For higher resolutions, the data needed to form a single screen image can be large, system also needs data for operations such as memory refresh, keyboard, mouse handling, drive access etc., this results in video data bottlenecks to avoid this Video accelerator is used. Incorporate processing power onto video board (rather than CPU) for graphics data processing.</p> <p>A graphics accelerator application specific chip (ASIC) that intercepts graphics tasks and processes them without the intervention of system CPU.</p> <p>Core of the accelerator is the graphics chip which connects directly to PC expansion bus.</p> <p>Graphics instructions and data are translated into pixel data and stored in video RAM.</p> <p>VRAM offers second data bus that is routed directly to RAMDAC</p>				<p>4M</p> <p><i>Explanation 2M</i></p>																																																																												



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	<p>(Random Access Memory Video to Analog Converter). Graphics chip directs RAMDAC operation and ensures that VRAM data is available. RAMDAC translates video data into R, G, and B video signals along with vertical and horizontal signals. Output signals generated by the RAMDAC drive the monitor.</p>  <p>Basic block diagram of a video accelerator board</p>	<p><i>Diagram 2M</i></p>
<p>d) Ans.</p>	<p>Explain opto-mechanical mouse with neat diagram. A combination of LED and photo detector is used to sense the distance traveled by the mouse. When mouse is moved across a flat surface, the ball protruding from the underside of the mouse and touching the surface starts to rotate in the direction of the movement.</p> 	<p>4M <i>Diagram 2M</i></p>



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		<p>Rotating ball touches and turns two rollers inside the mouse. These rollers are mounted at 90 degree angles to each other. One roller is used for vertical movement and the other roller is used for horizontal movement of cursor on the screen. Each roller is connected to a wheel, which rotates with movement of rollers. As the wheel rotates, a pair of photo detector detects the number of openings on the wheel passing between them. Each opening on the wheel allows light from the LED to fall on the photo detector and generate electrical signal. The direction in which the mouse is moving can be found out by finding the number of signals from vertical and horizontal rollers. These signals are sent serially to the PC over the mouse cable. The mouse driver software converts these signals into distance direction and speed necessary to move the cursor on the screen. Pressing a button on the mouse sends a signal to the PC. Based on which button is pressed, how many times it is pressed and the position of the cursor at the time of pressing the button, the mouse driver performs the task.</p>	<p><i>Explanation 2M</i></p>																																							
	<p>e) Ans.</p>	<p>Differentiate between firewire and USB.</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">Feature</th> <th colspan="2">Firewire</th> <th colspan="2">USB</th> </tr> <tr> <th>400</th> <th>800</th> <th>1.1</th> <th>2.0</th> </tr> </thead> <tbody> <tr> <td>Data transfer rate</td> <td>400 Mbps</td> <td>800 Mbps</td> <td>12 Mbps</td> <td>480 Mbps</td> </tr> <tr> <td>Number of devices</td> <td>63</td> <td>63</td> <td>127</td> <td>127</td> </tr> <tr> <td>Plug and play</td> <td>Yes</td> <td>Yes</td> <td>Yes</td> <td>Yes</td> </tr> <tr> <td>Hot-pluggable</td> <td>Yes</td> <td>Yes</td> <td>Yes</td> <td>Yes</td> </tr> <tr> <td>Isochronous devices</td> <td>Yes</td> <td>Yes</td> <td>Yes</td> <td>Yes</td> </tr> <tr> <td>Bus power</td> <td>Yes</td> <td>Yes</td> <td>Yes</td> <td>Yes</td> </tr> </tbody> </table>	Feature	Firewire		USB		400	800	1.1	2.0	Data transfer rate	400 Mbps	800 Mbps	12 Mbps	480 Mbps	Number of devices	63	63	127	127	Plug and play	Yes	Yes	Yes	Yes	Hot-pluggable	Yes	Yes	Yes	Yes	Isochronous devices	Yes	Yes	Yes	Yes	Bus power	Yes	Yes	Yes	Yes	<p>4M</p> <p><i>Any four differences 1M each</i></p>
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		Bus termination required	No	No	No	No	
		Bus type	Serial	Serial	Serial	Serial	
		Cable type	Twisted pair (6 wires: 2 power, 2 twisted-pair sets)	Twisted pair (8 wires: 2 power, 2 twisted-pair sets, 2 ground)	Twisted pair (4 wires: 2 power, 1 twisted-pair set)	Twisted pair (4 wires: 2 power, 1 twisted-pair set)	
		Networkable	Yes - peer-to-peer	Yes - peer-to-peer	Yes - host-based	Yes - host-based	
		Network topology	Daisy chain	Daisy chain	Hub	Hub	
	f) Ans.	Draw the block diagram of logic analyzer and explain it. Logic Analyzer: A logic analyzer is an electronic instrument that displays signals in a digital circuit that are too fast to be observed and presents it to a user so that the user can more easily check correct operation of the digital system. Fig. shows functional block diagram of logic analyzer. A logic analyzer is a device, which allows you to see the signals on 16 to 64 signal lines at once. It is also called multi-trace digital oscilloscope. It captures and stores several digital signals, letting you view the signals simultaneously.					4M



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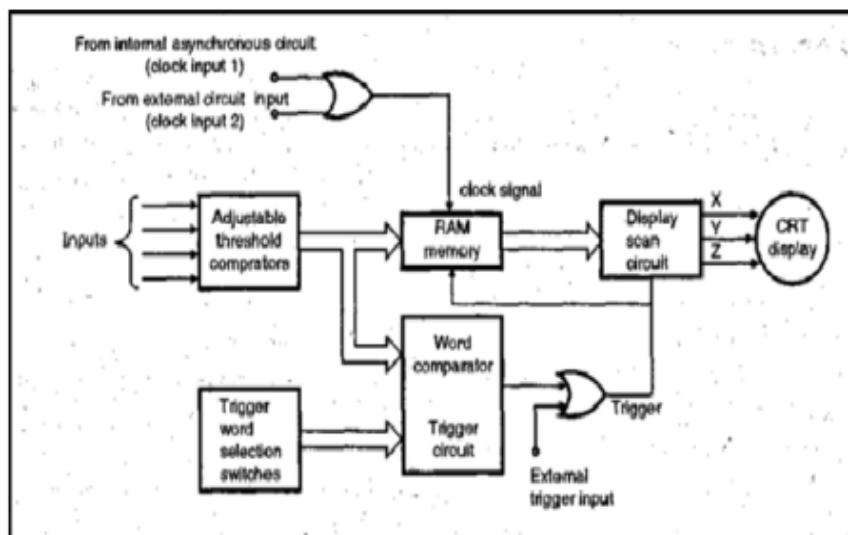


Fig: Block diagram of logic analyzer

Working:

- All the input signals are applied to the adjustable threshold comparator, one for each channel.
- The analyzer takes sample of each signal from the comparator and when clock pulse is applied stores it to memory.
- When trigger is applied to the memory, these samples are displayed.
- The analyzer can work in three modes:
 - Pre trigger mode (Analyzer displays 256 data samples that were taken just before the trigger).
 - Center trigger mode (Analyzer displays 128 data samples that were taken just before the trigger and 128 samples that were taken after the trigger).
 - Post trigger mode (Analyzer displays 256 data samples that were taken just after the trigger)

*Diagram
2M*

*Explana
tion 2M*

3.	a)	<p>Attempt any <u>FOUR</u> of the following: Define the terms related to hard disk drive. (i) Track (ii) Sector (iii) Cluster (iv) Cylinder</p>	16 4M
	Ans.		



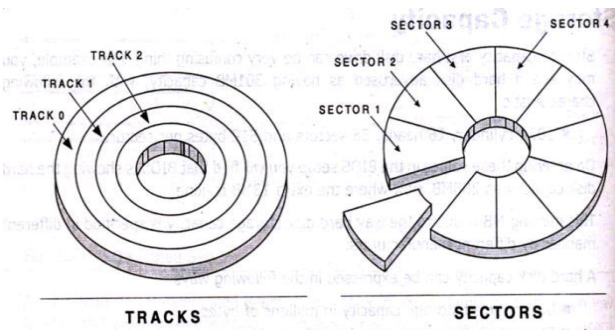
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(i) Track:

- Each side of HDD platters surface is divided into concentric circles called tracks
- They are magnetic information written during formatting of HDD
- Outermost track is called track 0. The innermost will have the highest number.



1M for each term

(ii) 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

(iii) 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



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		<ul style="list-style-type: none"> • Clusters are used to allocate the storage area for data area only, FAT and directory areas are not allocated according to the cluster size <p>(iv) Cylinder:</p> <ul style="list-style-type: none"> • 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 <div style="text-align: center;"> </div>	
<p>b) Ans.</p>	<p>Explain active matrix and passive matrix LCD.</p> <p>Active matrix LCD:</p> <ol style="list-style-type: none"> 1. A transistor and a storage capacitor are integrated at each cross point of electrodes. 2. To address a particular pixel, proper row is switched on and charge is sent down the correct column. 3. Only the capacitor at the designated pixel receives the charge. 4. Capacitor holds the charge until the next refresh cycle. <p>Passive matrix LCD</p> <ol style="list-style-type: none"> 1. Uses a simple grid to supply the charge to a particular pixel on the display. The liquid crystal material is sandwiched between the two glass substrates and a polarizing film is added to the outer side of each substrate. 2. To turn on a pixel, the integrated circuit sends a charge down the correct column of one substrate and a ground activated on the correct 	<p style="text-align: right;">4M</p> <p style="text-align: right;"><i>Active Matrix</i> 2M</p> <p style="text-align: right;"><i>Passive Matrix</i> 2M</p>	



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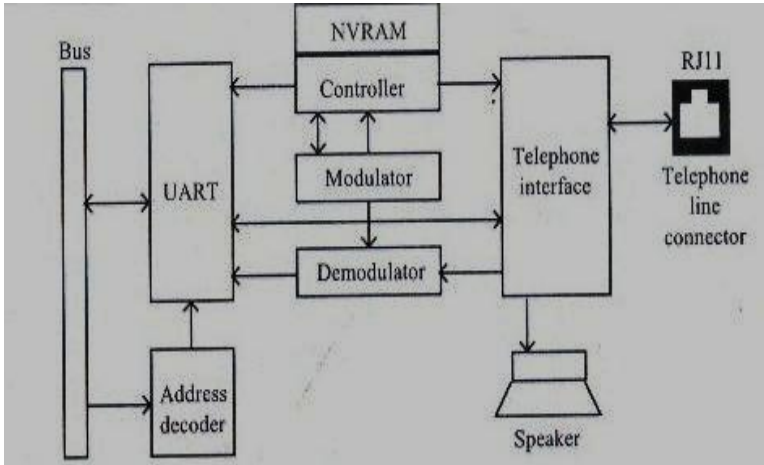
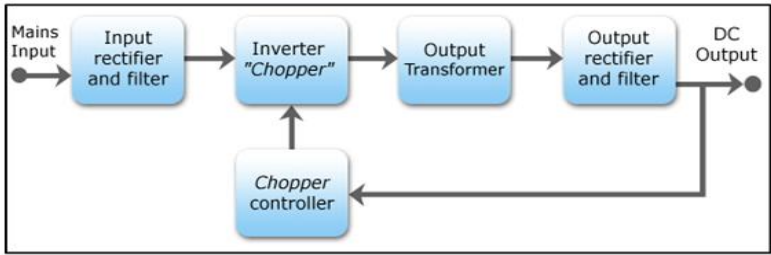
		<p>row of the other.</p> <p>3. The row and column intersect at the designated pixel, and that delivers the voltage to untwist the liquid crystals at that pixel.</p> <p>4. To address a pixel the column containing the pixel is sent a charge, the corresponding row is connected to ground.</p> <div style="text-align: center;"> </div>	
<p>c) Ans.</p>	<p>Explain the block diagram of internal modem.</p> <p>Internal modem:</p> <ul style="list-style-type: none"> • It contains its own Universal Asynchronous Receiver/Transmitter (UART). • 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 (DTMF) 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. • 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. 	<p>4M</p> <p><i>Explanation 2M</i></p>	



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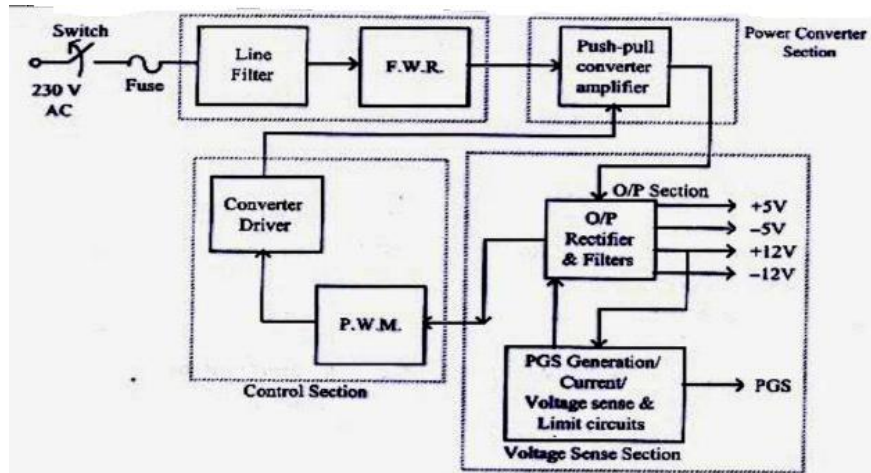
		<p>Once the connection is established, the speaker is disabled.</p> <ul style="list-style-type: none"> The controller circuit manages the overall operation of the modem. It switches the modem between the control and data operating modes. The controller accepts commands from the modulator that allow the modem characteristics and operating parameters to be changed. In the event of power loss or reset conditions default modem parameters are unloaded from NVRAM. Permanent changes to modem parameters are stored in the NVRAM. 	<p><i>Diagram 2M</i></p>
	<p>d) Ans.</p>	<p>With neat diagram explain the working of SMPS. Switched Mode Power Supply:</p>  <p style="text-align: center;">OR</p>	<p>4M</p> <p><i>Diagram 2M</i></p>



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Working of SMPS:-

Input rectifier stage:

AC line voltage is first cleaned by removing Electromagnetic Interferences that may be introduced by external noise, EMI filter remove noise-AC input Bridge rectifier and pifilter convert AC to DC and remove ripples, Unregulated DC fed as input to switching regulator.

Inverter “Chopper” Stage (PWM):

The series of square wave pulses produced by switching regulator (Chopper) are isolated, Chopper controller control ON and OFF time (width of square wave pulses). Inverter converts DC to AC which is then fed to transformer.

Output transformer:

It is used to isolate output from input signal. This converts the voltage up or down to required output level.

Output rectifier and filter:

AC output from transformer is rectified and the filter smoothens this output. Thus a pure DC voltage is obtained.

Choppercontroller

This is used to maintain desired voltage level. The actual value is compared with reference voltage.

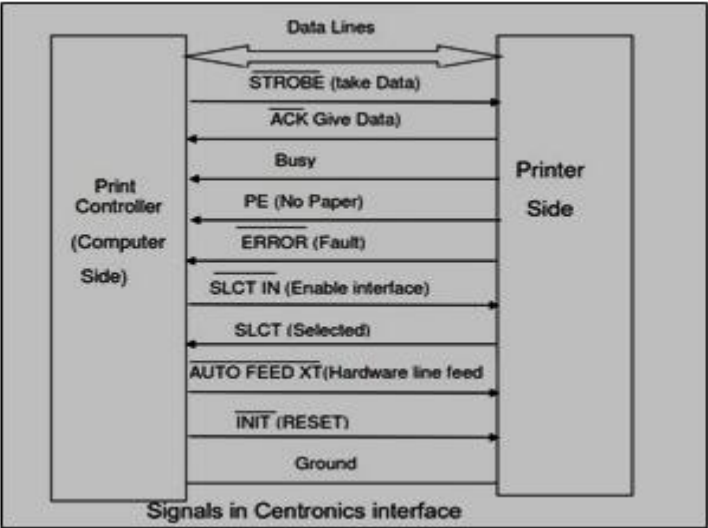
*Explana
tion 2M*



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		<p>If there is a difference found, the amplifier gives signal to (chopper controller) PWM controller. PWM controllers then adjust the ON period of switch so as to maintain the desired output voltage.</p>	
e) Ans.	<p>Draw the diagram of centronic interface and explain it.</p> <p>The Centronics parallel interface is an older and still widely-used standard I/O interface for connecting printers and certain other devices to computers. The interface includes a cable and a 36-pin male and female connector at the printer or other device. The cable plugs into a 25-pin parallel port on the computer. Data flows in one direction only, from the computer to the printer or other device. In addition to eight parallel data lines, other lines are used to read status information and send control signals.</p>	<div style="text-align: center;">  <p style="text-align: center; margin-top: 5px;">Signals in Centronics interface</p> </div>	<p style="text-align: center;">4M</p> <p style="text-align: center;"><i>Explanation</i> 2M</p> <p style="text-align: center;">Diagram 2M</p>
f) Ans.	<p>What is active and passive preventive maintenance?</p> <p>Maintenance of PCs:</p> <p>Preventive Maintenance can be of two types:</p> <p style="margin-left: 20px;">a) Active preventive maintenance</p> <p style="margin-left: 20px;">b) Passive preventive maintenance</p> <p>Active preventive maintenance procedure</p> <ul style="list-style-type: none"> • It describes several procedures to clean and lubricate all the major components, cleaning all boards, connectors, contacts etc. • It also describes similar procedures for different peripheral devices such as HDD, FDD, keyboard, printer, monitor etc. 	<p style="text-align: center;">4M</p>	



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		<ul style="list-style-type: none">It includes performing backups, antivirus and antispy ware scans. <p>Active preventive maintenance procedure: Cleaning a system</p> <ul style="list-style-type: none">Regular and through cleaning of the system removes any layer of dust and benefits the system in the long run.Dust acts as the insulator, which prevents proper system cooling,Excessive heat shortens the life of system components.Dust can contain conductive elements that can cause partial short circuit in the system. Other elements in the dust can accelerate corrosion on electrical contacts. <p>Passive preventive maintenance procedure</p> <ul style="list-style-type: none">It includes periodic care of external factor which affect working of the PC i.e. mainly providing the best possible physical and electrical environment for the PC to operate.It involves taking care of the system from physical environment and electrical problems.Physical conditions such as temperature, thermal stress, dust and smoke contamination and shock and vibration.Electrical issues such as ESD (Electro Static Discharge), power linoise and RFI (Radio frequency interference)	<p><i>Active Maintenance 2M</i></p> <p><i>Passive Maintenance 2M</i></p>
4.	a) Ans.	<p>Attempt any <u>FOUR</u> of the following:</p> <p>Explain the term extended memory.</p> <p>Extended Memory:</p> <ul style="list-style-type: none">It is the memory beyond 1 MB limit.Any memory available after 1 MB is called extended memory.It is available in 286 and later processors only..For windows users this memory is very useful as the OS can use this extended memory by allowing multiple DOS programs to run in the extended memory in its own 640 KB memory area. <p>With the minor exception of the High Memory Area (HMA), extended memory can be addressed only by applications run in real mode. It is possible, however, for DOS applications to make use of this memory to store data (but not to execute code directly from there). XMS (eXtended Memory Standard, promulgated by Microsoft) permits applications to allocate extended memory and takes care of copying data to and from extended memory and</p>	<p>16 4M</p> <p><i>Explanation 3M</i></p>



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		<p>conventional memory so that the application does not have to worry about switching between modes.</p> <div style="text-align: center;"> <p>The diagram illustrates the memory hierarchy. At the top is 'Extended Memory' ranging from 16 MB to 4 GB. Below it is 'HMA' (High Memory Area) which is 1 MB wide. Under HMA is 'UMA' (Upper Memory Area) which is 640 KB wide. At the bottom is 'Conventional Memory' starting from 0 KB.</p> </div>	<p><i>Diagram 1M</i></p>
<p>b) Ans.</p>	<p>Explain the terms low level and high level formatting.</p> <p>Formatting:</p> <ul style="list-style-type: none"> • Hard Disk drive requires a low-level formatting and a high level Formatting to make it useful for data storage • Low level formatting magnetically divides the disk into tracks and sectors • High level formatting is done on hard disk to make the disk DOS compatible by writing DBR, FATs and empty root directory information on the drive. <p>❖ Low level formatting:</p> <ul style="list-style-type: none"> • It is called physical formatting. • Low-level formatting is the process of outlining the positions of the tracks and sectors on the hard disk, and writing the control structures that define where the tracks and sectors are. • It really creates the physical format that defines where the data is stored on the disk. • Low level formatting is done in the factory itself. <p>➤ <u>Functions of low level formatting</u></p> <ul style="list-style-type: none"> • Dividing the disk surface into tracks and sectors. • Establishing interleave factor. • Marking identification information on each track and sector. • Marking defective sectors. <p>❖ High level formatting:</p> <ul style="list-style-type: none"> • High-level formatting is the process of setting up an empty file 	<p>4M</p> <p style="text-align: right;"><i>Low level formatti ng 2M</i></p>	



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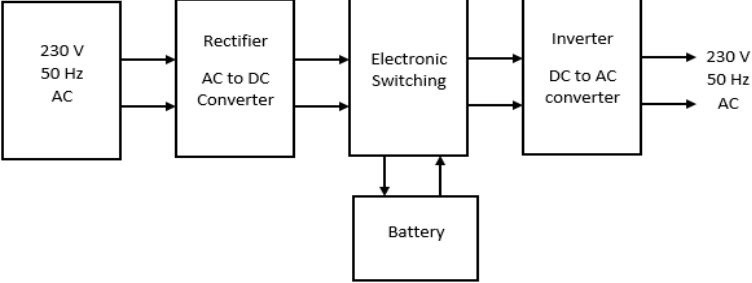
		<p>system on a disk partition or logical volume and, for PCs, installing a boot sector.</p> <ul style="list-style-type: none">• After low level formatting and partitioning, final step for preparing the hard disk drive for use is high level format the drive• High level format program need to only create File Allocation Table, directory system etc. so that the operating system can use the HDD for storage purpose.• It creates the file system format within a disk partition or a logical volume.• It can be done during OS installation or new partition creation.	<p><i>High level formatting 2M</i></p>
	<p>c) Ans.</p>	<p>Describe any four characteristics of CRT color monitor. Characteristic of CRT monitor:</p> <p>1) Frame Rate: This is used to show the number of times a screen full of information is produced per second or the number of times a frame is shown (in one second) on the monitor. OR Frequency at which whole screen is redrawn.</p> <p>2) Resolution: Resolution describes the number of potential pixels the monitor is capable of displaying. Resolution = Total Horizontal Pixels x Total vertical pixels.</p> <p>3) Dot pitch: It is the distance between each group (triad) of red, blue and green phosphors. A smaller dot pitch helps produce sharper and clearer image</p> <p>4) Video band width: It is the highest input frequency a monitor can handle and helps in determining the resolution capabilities of the monitor, band width is measured in MHz. Higher the video bandwidth, better the image quality.</p> <p>5) Horizontal scanning: Scanning of the electron beam across the screen of the monitor is called raster scanning. The tracing of the horizontal lines in synchronism with H-Sync pulse is called Horizontal Scanning</p> <p>6) Vertical Scanning Frequency: The frequencies at which the monitor repaints the whole screen, It is also called as vertical scanning frequency. Unit: Hz (no. of cycles per second)</p>	<p>4M</p> <p><i>Any four characteristic of CRT monitor 1M each</i></p>
	<p>d) Ans.</p>	<p>Explain the working of offline UPS with neat diagram.</p>	<p>4M</p>



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	<p>Offline UPS:</p>  <p>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.</p> <p>When the AC main fails the electronic switch takes power from the battery and using inverter converts it into AC to be given to the load.</p> <p>They use a special circuit that senses the ac line current. If the sensor detects a loss of power on the line, the system quickly switches to the standby power system (SPS). The SPS transforms the load to the inverter which draws power from the attached batteries.</p>	<p>Diagram <i>2M</i></p> <p>Explanation <i>2M</i></p>
<p>e)</p> <p>Ans.</p>	<p>Explain the sequence of events in RS-232 communication. <i>(Note: With RS232 handshaking, RS232 communications only will take place when both ends of the RS232 link are ready. Thus, the RS232 handshake process enables the DTE to request control of the communications link from a related modem and allows the modem to inform the terminal equipment that the control has been acquired).</i></p> <p>There are several types of sequence of events in RS-232 communication.</p> <ol style="list-style-type: none">1. It starts with<ol style="list-style-type: none">a) RTS – Request to Sendb) CTS – Clear to Sendc) DTR – Data Terminal Ready2. Then it starts with handshake. The RS232 handshake process involves four steps:<ol style="list-style-type: none">a) The data terminal equipment (DTE) puts the RTS line into the	<p>4M</p> <p><i>Any Sequence of events</i> 4M</p>



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		<p>“On” state.</p> <p>b) The data communications equipment (DCE) puts the CTS line into the “On” state.</p> <p>c) The DTE puts the DTR line into the “On” state.</p> <p>d) The DTR line remains in the “On” state while data is being transmitted.</p> <p>3. After the transmission of data is completed, the DTE puts the DTR and RTS lines into the “Off” state and the DCE puts the CTS line into the “Off” state.</p>	
f)	Ans.	<p>Explain the POST sequence in detail. <i>(Note: Partial marking can be consider for appropriate sequence)</i></p> <p>POST sequence of PC:</p> <p>1. CPU Test Different flags and registers within the CPU are tested. Testing is done by setting, resetting and moving the data from one register to another. If the any flag is not reset then system is halted with the execution of the halt instruction. On noticing any error system is halted.</p> <p>2. BIOS ROM Test The contents of the 8k ROM containing POST and BIOS is verified by checksum calculation method. The subroutine for ROM checksum performs EXOR addition of the content of all the locations in the 8K ROM from the start address, and if checksum result is zero, then the content of the ROM are OK. The last location contains the checksum of the previous locations and if the checksum is not zero then system is halted with the execution of the halt instruction. If BIOS is corrupted or IPL has Fault, when such errors are detected, the CPU is halted and the checkpoint 01 is present on port A pins.</p> <p>3. Timer 1 Test The timer 1 in PIT (8253) is tested. The Timer 1 is set as rate generator in mode 2 .Set an initial value in Timer 1 .Latch. Timer 1 count .After some delay read Timer1 count and check if it counts too slow. If so, the POST halts. When Timer is reset, a mild click sound is heard from the speaker on detecting an error, the CPU is halted and checkpoint 02 is present on port a pins.</p> <p>4. DMA Channel 0 Test The channel 0 of DMA controller is tested here. In this portion of</p>	<p>4M</p> <p style="text-align: right;"><i>Correct Sequence 4M Relevant Description</i></p>



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	<p>POST, the channel 0 of DMA controller is initialized with appropriate start address and byte count values, so that this channel is ready for performing memory refresh DMA cycles when Timer 1 sends DMA Request signal The CPU is halted if any error is found and checkpoint 03 is present on port A pins.</p> <p>5. Base 16K RAM Test The first 16 k RAM occupying the address hex 00000 to 03FFF is tested. In each location five different test patterns (00, FF, 55, AA, 01) are written and verified by reading back. There are two types of failures during this test: (a) The pattern written and the pattern read are different (b) The pattern written and the pattern read may be same but there is parity error during reading. If any error is noticed, check point 04 and failing bit pattern are alternatively outputted repeatedly on port A pins. During warm boot, the POST skips the video RAM test.</p> <p>6. CRT Controller Test CRT controller 6845 and the video buffer RAM in the display adapter are tested. Display adapters can be configured by setting the DIP switches which post identifies by reading DIP switch If no display adapter is present, the POST skips all video adapter tests If any error is noticed, beep sounds are produced on the speaker.</p> <p>7. Motherboard Support Chips Test The interrupt controller, timer (8253) and keyboard interface are tested here. If any error is noticed, an error code is displayed on the CRT monitor.</p> <p>8. RAM Test RAM after the first 16 kb is tested here for five different patterns (AA, 55, FF, 01 and 00). A detailed error message indicating the failing address and failing bits is displayed on the CRT screen.</p> <p>9. Optional ROM Test The ROMs in hard disk controller are tested by checksum method.</p> <p>10. Peripheral Controller Test The Floppy Controller, Parallel Ports, Serial Ports and Hard Disk</p>	
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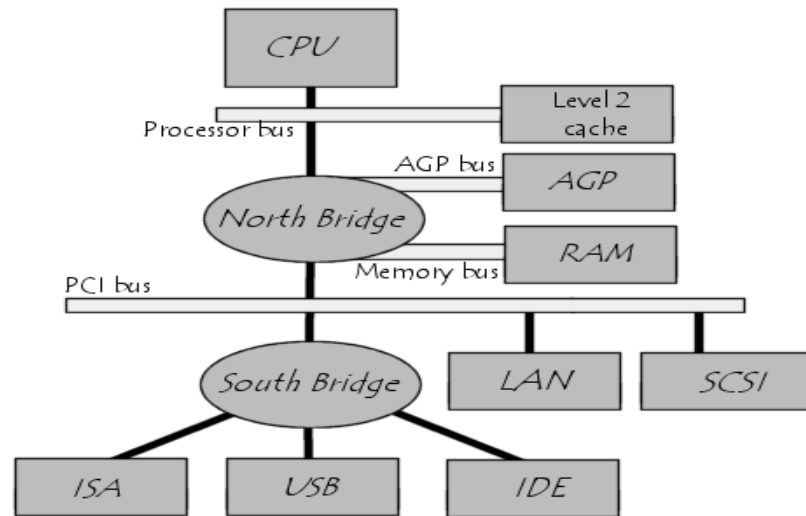
		<p>Controller are tested here. A detailed error message is displayed on the screen if any error is noticed. At the end of all the tests, the POST passes control to the boot strap loader program in BIOS. The boot strap loader reads the initial program from track 0 on floppy disk or hard disk. This initial program reads more programs from the floppy disk or hard disk, which is nothing but the DOS.</p>	
5.	<p>a)</p> <p>Ans.</p>	<p>Attempt any <u>TWO</u> of the following:</p> <p>Draw the block diagram of North Bridge/South Bridge architecture and explain it in detail.</p> <p>North Bridge- South Bridge Architecture: Intel's earlier chipset were broken into multi-tired architecture known as North Bridge and South Bridge components as well as Super I/O chip.</p> <p>North Bridge:It is the connection between the high speed processor bus and the slower AGP & PCI buses.</p> <p>South Bridge:It is the bridge between PCI bus and even slower ISA bus.</p> <div style="text-align: center;"> <pre> graph TD CPU([CPU]) <--> FSB NB[North Bridge] NB <--> AGP([AGP]) NB <--> RAM([RAM]) NB --- SB[South Bridge] SB --- PCI[PCI] SB --- USB[USB] SB --- ISA[ISA] SB --- IDE[IDE] SB --- Legacy[Legacy] SB --- BIOS[BIOS] </pre> </div> <p>Figure: North Bridge/South Bridge Architecture</p>	



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North Bridge:

- It is the connection between the high speed processor bus and the slower AGP & PCI buses.
- It is responsible for communication from the CPU to memory, the CPU to the PCI (Peripheral Component Interconnect) Express bus, and the Advanced Graphics Port (AGP) device.
- It is the only motherboard circuit (besides the processor) that runs at the full motherboard speed.
- It serves as the four way connection between CPU, Memory, Video card and south bridge

South Bridge:

- It is the bridge between PCI bus and even slower ISA bus.
- It is responsible for communication between the CPU and other devices, such as PCI, ISA, and IDE devices.
- The Southbridge actually contains some On-chip integrated peripherals, such as Ethernet, USB and audio devices.
- It is responsible for communication between the CPU and other devices, such as PCI, ISA, and IDE devices.

These two chips contain the bulk of the logic that allows a CPU to communicate with other hardware.

Explanation 4M



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	<p>b)</p> <p>Ans.</p>	<p>Write about the hard disk drive construction and working with neat labeled diagram.</p> <p>Hard disk drive construction and working:</p> <p>Construction :</p> <p>A hard disk drive is a sealed unit that a PC uses for nonvolatile data storage. Nonvolatile, or semi-permanent, storage means that the storage device retains the data even when no power is supplied to the computer. A hard disk drive contains rigid, disk-shaped platters, usually constructed of aluminum or glass.</p> <p>Hard Disk Drive Components:</p> <ol style="list-style-type: none">1- Disk platter2- Read/Write head3- Head arm/Head slider4- Head actuator mechanism5- Spindle motor6- Logic board7- Air filter8- Bezel9- Cables & Connectors <p>1. Platters: A hard disk drive has one or more flat circular disk called platters. Platters are made of an Aluminum alloy, which provides both strength and light weight. Newer HDDs use glass and glass ceramic platters. These platters are coated with magnetizable media coating which can store information magnetically. Two types of recording media used in HDD namely Iron oxide media and Thin film media.</p> <p>2. Read /Write Head: A hard disk drive usually has one read/write head for each platter surface, such that each platter has two sets of read/write heads - one for the top side and one for the bottom side. These heads are connected, or ganged, on a single movement mechanism.</p> <p>3. Head Actuator Mechanism: This mechanism moves the heads across the disk and positions them accurately above the desired cylinder. Two types of actuators are Stepper motor actuators and Voice coil actuators.</p> <p>4. Head Arm/Head Slider: The arm on which the Read/Write head is located, and connects to the actuator.</p>	<p>8M</p> <p><i>Constru ction 2M</i></p> <p><i>Explana tion 4M</i></p>
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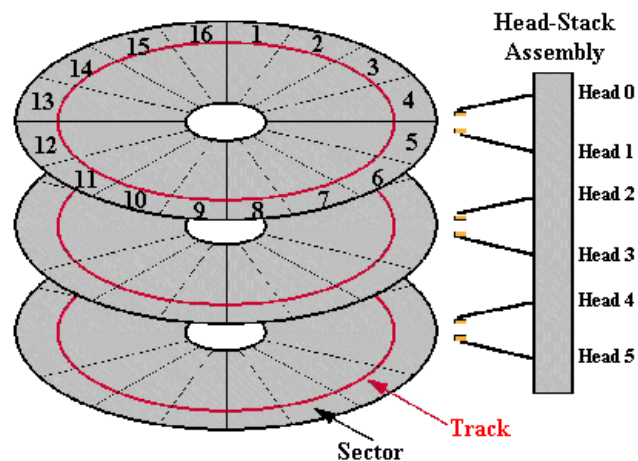
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5. Spindle Motors: The motor that spins the platters is called the spindle motor, because it is connected to the spindle around which the platters revolve. Spindle motors in hard disk drives are always connected directly; no belts or gears are involved. The spindle motor also must be precisely controlled for speed.
6. Logic Boards: Logic board with electronic components controls all these different parts of HDD. An intelligent circuit board is built into the hard disk. It also acts as an interface between the hard disk drive and the computer.
7. Air Filters: Nearly all hard disk drives have two air filters. One filter is called the recirculation filter, and the other is called breather filter. These filters are permanently sealed inside the drive and are designed never to be changed for the life of the drive. The recirculation air filter is used to filter any particles dislodged from inside the drive such as scarp of the disk media.
8. Bezel: Front faceplate provided on most of the HDD.
9. Most drives have at least these three types of connectors: Interface connector(s), Power connector and Optional ground connector.

Working principle:

Diagram:



OR

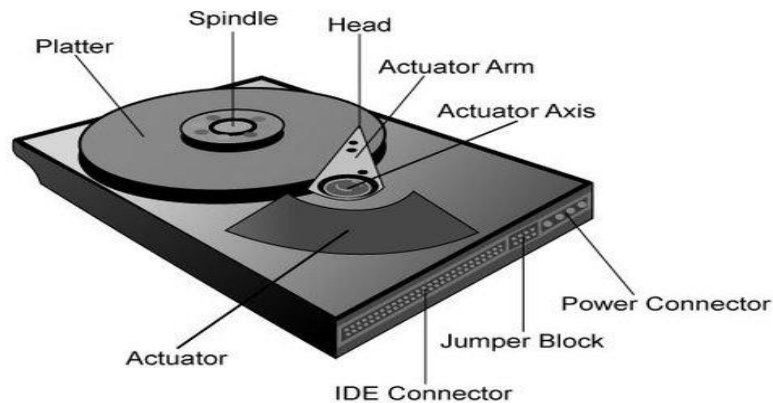
*Working
-
Diagram
- 2M*



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A hard disk uses round flat disks called platters, coated on both sides with magnetic media to store information. The platters rotate at a speed of about 3600 rpm -7200 rpm and read/write heads are used to read or record the information. This information is communicated to the system with the help of a logic board.

Each platter has two heads which are mounted onto sliders and used to either record information onto the disk or read information from it. The sliders are mounted onto arms which are thin pieces of metal usually triangular in shape. The arms are controlled using a device called an actuator that positions the arms to the appropriate track on the disk. All R/W heads are lined up and mounted on the Actuator. So when one head is over a track, all the other heads will also move and they will be at the same location over their respective surfaces.

The spindle motor is responsible for turning the hard disk platters, allowing the hard drive to operate.

	c) Ans.	Name the different types of key switches in keyboard. Explain the principle of working of any one in detail. Various key switches in keyboard: Types of Key switches: 1. Capacitive switch 2. Opto –electronic switch 3. Membrane switch 4. Mechanical switch 5. Rubber Dome switch	8M <i>List 2M</i>
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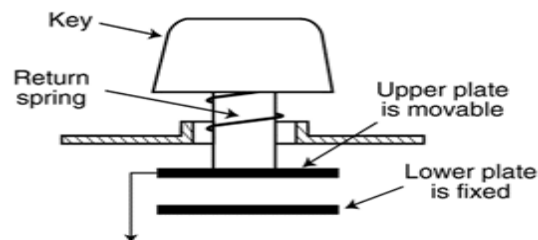
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1. Capacitive switch:

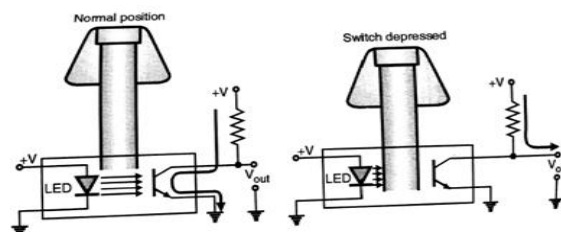
In Capacitive Key switch two plates of capacitor are used, when key is pressed plates comes closer and key released plates move away. The capacitance of the switch is changed and this change can be detected by measuring the voltage change across the switch using some sense amplifier.

Sense amplifier measures the voltage change across the switch, Receive one voltage when switch is in open position and another voltage when the switch is in closed position. These voltages are converted into proper logic signal (keyboard circuitry) to inform CPU. Lifespan of this switch is about 20 million keystrokes.



2. Opto – Electronic Switch:

In Opto- Electronic switch, LED and Phototransistors are used. LED generates light when proper electric power is applied and opposite to LED phototransistor is used. Phototransistor allows the current as long as light is applied to it, if light falling to phototransistor is removed then current does not flow through it. When key is not pressed, light falls onto phototransistor, so the current flows through the phototransistor and produces very low voltage at the output V_{out} . When key is depressed light emitted from LED is blocked which stops current flow through phototransistor, and a different value is produced at the output V_{out} .



*Explana
tion with
diagram
6M*



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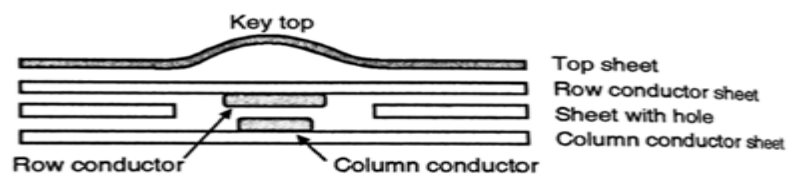
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3. Membrane Switch

It is multilayer plastic or rubber assembly where two rubber or plastic sheet are used as row and column conductor sheet. Row and column sheet having lines are made up of silver or some other conductor ink. These row and column sheet is separated by another sheet with holes at key top position.

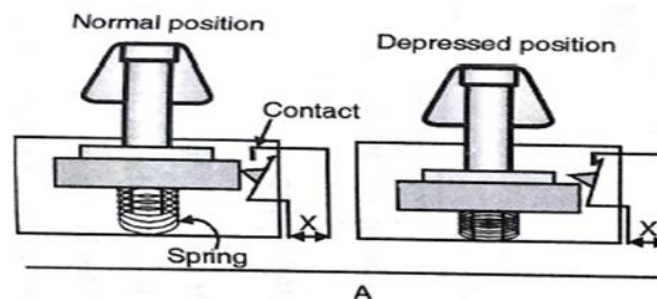
When Key is pressed, it forces the row conductor sheet through the hole to touch the column conductor sheet, Row conductor lines when touches with column conductor lines, a key contact is made. Thus the keyboard interface interprets it as key pressed condition.



Membrane type keyboard switch

4. Mechanical Switch

Two metal pieces or contacts are used and are kept in open position and moved into closed position when the switch is depressed. When key is not pressed (normal position) contact is in open position and when key is depressed contact is in closed position. This contact is sensed by keyboard interface at the location 'X'. To improve lifespan of switch gold plating done on this contact. Life of this type of switch is around 1 million keystroke.



5. Rubber dome switch

Dome-switch keyboards are a hybrid of flat-panel membrane and mechanical keyboards. It uses small, flexible rubber domes, each with a hard carbon center. When a key is pressed, a plunger (spring on the



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		<p>bottom of the key) pushes down against the dome, and the carbon center presses against a hard, flat surface beneath the key matrix. As long as the key is held, the carbon center completes the circuit. When the key is released, the rubber dome springs back to its original shape, forcing the key back up to its at-rest position.</p>	
6.	a)	<p>Attempt any <u>TWO</u> of the following: Explain three modes of operation of CPU. (i) Real mode (ii) Virtual real mode (iii) Protected mode</p> <p>Ans. (i) Real mode: The original IBM PC could only address 1 MB of system memory, and the original versions of DOS created to work on it were designed with this in mind.</p> <ul style="list-style-type: none"> • The DOS operating system requires the microprocessor to operate in the real mode. • Real mode operation allows application software written for the 8086/8088, which contains only 1 M byte of memory, to function in the 80286 and above without changing the software. • DOS is by its nature a single-tasking operating system, meaning it can only handle one program running at a time. • The upward compatibility of software is partially responsible for the continuing success of the Intel family of microprocessors. • In all cases, each of these microprocessors begins operation in the real mode by default whenever power is applied or the microprocessor is reset. • When a processor is running in real mode, it accesses memory with the same restrictions of the original 8088: a limit of 1 MB of addressable RAM, and slow memory access. <p>(ii) Virtual real mode:</p> <ul style="list-style-type: none"> • Virtual real is essentially a virtual real mode with 16-bit environment that runs inside 32-bit protected mode. • When you run a DOS prompt window inside Windows, you have created a virtual real modesession. • Note that any program running in a virtual real mode window can access up to only 1MB of memory, which that program will believe is the first and only megabyte of memory in the system. • If you run a DOS application in a virtual real window, it will have 	<p>16 8M</p> <p style="text-align: right;"><i>Real mode</i> 2M</p> <p style="text-align: right;"><i>Virtual real mode</i> 3M</p>



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		<p>a 640 KB limitation on memory usage. That is because there is only 1 MB of total RAM in a 16-bit environment, and the upper 384KB is reserved for system use.</p> <ul style="list-style-type: none"> • The virtual real window fully emulates an 8088 environment, so that aside from speed, the software runs as if it were on an original real mode-only PC. Each virtual machine gets its own 1 MB address space, an image of the real hardware basic input/output system (BIOS) routines, and emulation of all other registers and features found in real mode. <p>(iii) Protected mode:</p> <ul style="list-style-type: none"> • This mode is the native state of the processor. • In this mode all instructions and architectural features are available, providing the highest performance and capability. This is the recommended mode for all new applications and operating systems. • Among the capabilities of protected mode is the ability to directly execute “real-address mode” 8086 software in a protected, multi-tasking environment. • It has full access to all of the system's memory. There is no 1 MB limit in protected mode. • It has the ability to multitask, meaning having the operating system manage the execution of multiple programs simultaneously. • It supports virtual memory, which allows the system to use the hard disk to emulate additional system memory when needed. • It has faster (32-bit) access to memory, and faster 32-bit drivers to do I/O transfers. 	<p><i>Protecte d mode 3M</i></p>																				
	<p>b) Ans.</p>	<p>Write about the Blue Ray Disc Specification.</p> <p>Blue Ray Disc Specification:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <thead> <tr> <th style="text-align: center;">Specification</th> <th style="text-align: center;">Typical Value</th> </tr> </thead> <tbody> <tr> <td>Capacity (Single Layer)</td> <td>23.3GB/25GB/27GB</td> </tr> <tr> <td>Capacity (Dual Layer)</td> <td>46.6GB/50Gb/54Gb</td> </tr> <tr> <td>Laser wavelength</td> <td>405nm (blue-violet)</td> </tr> <tr> <td>Lens Numerical Aperture</td> <td>0.85</td> </tr> <tr> <td>Cartridge dimensions</td> <td>129X131X7mm (Approx)</td> </tr> <tr> <td>Disc Diameter</td> <td>120mm</td> </tr> <tr> <td>Disc Thickness</td> <td>1.2mm</td> </tr> <tr> <td>Optical Protection Layer</td> <td>0.1mm</td> </tr> <tr> <td>Tracking Pitch</td> <td>0.32µm</td> </tr> </tbody> </table>	Specification	Typical Value	Capacity (Single Layer)	23.3GB/25GB/27GB	Capacity (Dual Layer)	46.6GB/50Gb/54Gb	Laser wavelength	405nm (blue-violet)	Lens Numerical Aperture	0.85	Cartridge dimensions	129X131X7mm (Approx)	Disc Diameter	120mm	Disc Thickness	1.2mm	Optical Protection Layer	0.1mm	Tracking Pitch	0.32µm	<p>8M</p> <p><i>Any 8 specifica tions each 1M</i></p>
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<p>c)</p> <p>Ans.</p>	<p>Draw 20 pin ATX power connector with color code and state the function of PS-ON, 5VSB, PW-OK signals.</p> <p>ATX 20 pin Power Connector:</p> <div style="text-align: center;"> <p>The diagram shows a 20-pin ATX power connector with the following pin configurations:</p> <ul style="list-style-type: none"> Pin 1: +3.3V (Orange) Pin 2: +3.3V (Orange) Pin 3: Common (Black) Pin 4: +5V (Red) Pin 5: Common (Black) Pin 6: +5V (Red) Pin 7: Common (Black) Pin 8: Pwr OK (Grey) Pin 9: +5V SB (Purple) Pin 10: +12V (Yellow) Pin 11: +3.3V (Orange) Pin 12: -12V (Blue) Pin 13: Common (Black) Pin 14: PS On (Green) Pin 15: Common (Black) Pin 16: Common (Black) Pin 17: Common (Black) Pin 18: -5V (White) Pin 19: +5V (Red) Pin 20: +5V (Red) </div> <p>Colour Code:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Signal</th> <th>Color Code</th> </tr> </thead> <tbody> <tr> <td>3.3V</td> <td>Orange</td> </tr> <tr> <td>+5V</td> <td>Red</td> </tr> <tr> <td>+12V</td> <td>Yellow</td> </tr> <tr> <td>- 12V</td> <td>Blue</td> </tr> <tr> <td>-5V</td> <td>White</td> </tr> <tr> <td>Common</td> <td>Black</td> </tr> <tr> <td>Pwr Ok (Power Good)</td> <td>Grey</td> </tr> <tr> <td>+5V SB</td> <td>Purple</td> </tr> <tr> <td>PS ON (POWER ON)</td> <td>Green</td> </tr> </tbody> </table>		Signal	Color Code	3.3V	Orange	+5V	Red	+12V	Yellow	- 12V	Blue	-5V	White	Common	Black	Pwr Ok (Power Good)	Grey	+5V SB	Purple	PS ON (POWER ON)	Green	<p>8M</p> <p><i>Diagram 3M</i></p> <p><i>Colour code 2M</i></p>
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	<ol style="list-style-type: none">PS_ON or Power on: This has a green wire which is a signal from the motherboard to the power supply. When the line is connected to ground (by the motherboard), the power supply turns on. It is internally pulled up to +5 V inside the power supply.PWR_OK or Power Good: is an output from the power supply that indicates that its output has stabilized and is ready for use. It remains low for a brief time (100–500 ms) after the PS_ON signal is pulled low.+5 VSB or +5 V standby: Supplies power even when the rest of the supply lines are off.	<p><i>Each function 1M</i></p>
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