

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 judgment 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 Attempt any **THREE** of the following

12M

i) Describe JPEG compression system and state its application.

Ans:- (Description 2 M; Application 2 M- any 2 applications)

[Note:- diagram is optional yet any relevant diagram shall be considered]

JPEG Compression System:-

- JPEG typically achieves 10:1 compression ratio with little perceptible loss in quality. It specifies the codec used by digital cameras and other photographic image capturing devices. The principle behind compression of image take note of the fact that the human eye is less sensitive to gradual transitions and also less sensitive to color variations as compared to brightness variations.

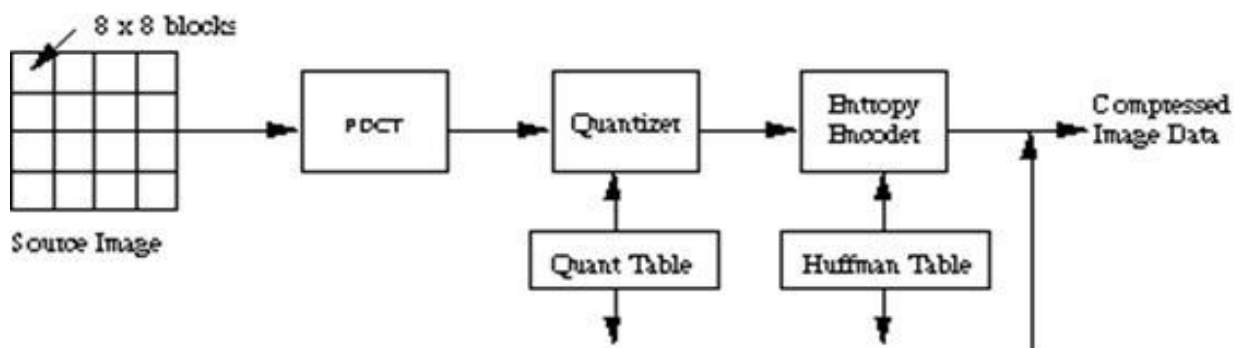
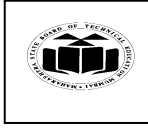


Figure:-JPEG compressor system

- Pixel in the image are converted into luminance and chrominance(Y, Cb and Cr) components, sampling them with 4:4:2 or 4:2:0 proportions, depending on the quality required. Then the image is converted into 8X8 matrix blocks. They are processed, using discrete cosine Transform (DCT), the frequency component in samples is taken at regular intervals. The distinction in two types of formats uses real



components only. The process discards those frequencies which do not affect the image as the human eye perceives it. The signals accepted in quantization process are coded using Huffman code. The compressed data is stored and transmitted.

Application:-

- 1) The JPEG compression algorithm is at its best on photographs and paintings of realistic scenes with smooth variations of tone and color.
- 2) For web usage, where the amount of data used for an image is important.
- 3) JPEG is also the most common format saved by digital cameras.
- 4) It is used in mobile phone cameras.
- 5) It is used in internet for exchange of photographs.

ii) List the application of CCTV.

Ans:- (1M Each Application)

Application of CCTV:- (Any 4)

1. Surveillance
2. Education
3. Medical care
4. Industry
5. Safety
6. Business
7. Home
8. Traffic Control
9. Crowd Control
10. Aerospace and Oceanography

iii) List name of different motor used in CD player and state its application.

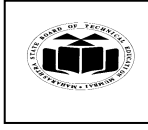
Ans:- (List 1 M, Application 3M – 1 M for each applications)

Name of different motor used in CD player are as follows:-

1. Tray, Loading, Carriage Motor
2. Slide, Sled, Feed Motor
3. Spindle ,Disc, Turntable Motor

Applications:-

- Tray, Loading, Carriage Motor pushes out and pulls in the VCD tray when the open/close switch is pressed.
- The slide, feed or sled motor moves the optical pickup unit from the center to outer edge of the disk on sliding rods.
- A disc, spindle, or turntable motor rotates the VCD at a variable speed. The disc motor rotates faster at the beginning and slows down as the laser assembly moves toward the outer edge of the VCD.



iv) Compare DVD and BD (any four points)

Ans:- (Any four points 1 M each)

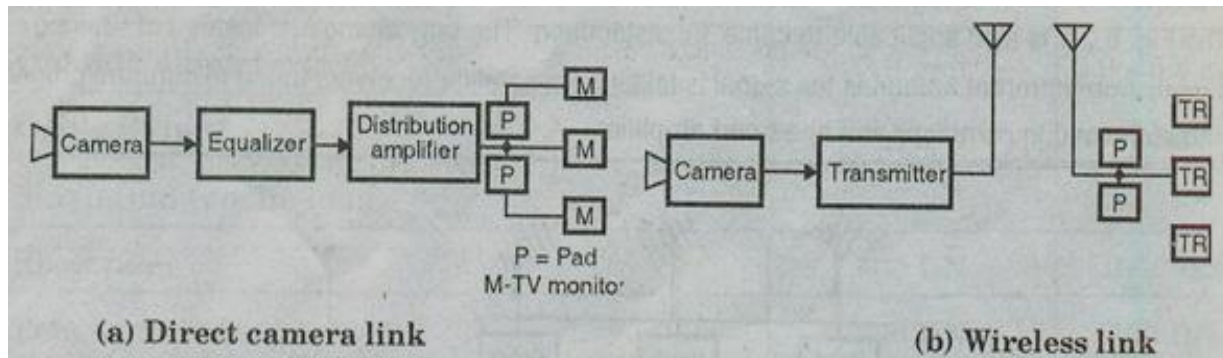
SR.NO	ITEM	DVD	BD
1	Developed by	DVD forum in 1995	BD association in 2002
2	Sensor	Red laser(650 nm)	Blue-violet
3	Numerical aperture	0.6	0.85
4	Compression	MPEG-2	MPEG-2 and MPEG4/H.264
5	Capacity per layer	4.7 GB	25GB
6	Disk size	12 cm	12 cm
7	Track pitch	0.32 micrometer	0.74 micrometer
8	Single side dual layer	8.5 GB	50 GB
9	DSDL	17GB	100GB
10	Thickness of cover	0.6 mm	0.1 mm
11	Resolution	480/576	1080/720/576/480
12	SDTV movies	8 hours	23 hours
13	HD movies	Not Possible	8 hours

b) Attempt any ONE of the following

06M

i) Draw block diagram of CCTV system and illustrate its working

Ans:- (Diagram 3 M, Working 3M)



OR

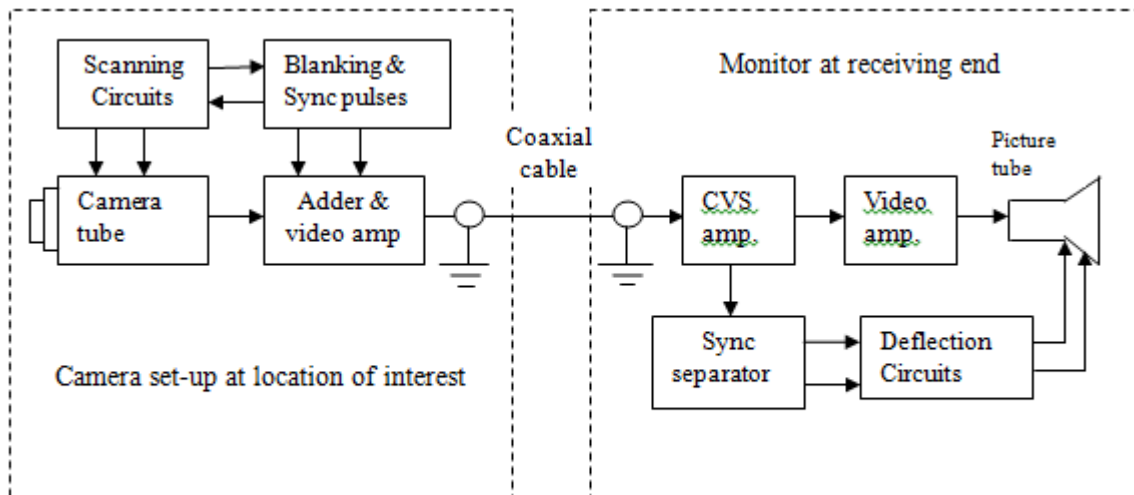


Figure: Block diagram of CCTV system

• **Working :-**

CCTV is a system in which video signal obtained by one or more camera tubes is sent to one or more monitors through coaxial cables.

• **Camera Tube:**

It is the eye of CCTV system and can be placed at any strategic location to see the scene and convert it into a video signal. It is equipped with scanning circuit which produces deflection current for horizontal and vertical deflection. These currents are duly synchronized by blanking and sync pulse generators. The camera tube is visually of vidicon type.

• **Video Amplifier at the Transmitting End:**

This amplifies video output of the camera tube. Blanking and sync pulses are added to the signal, resulting in a composite video signal. As high frequency component of the video signal are attenuated more in the coaxial cable than low frequency components, there is pre-emphasis of high frequency signals. This takes care of uneven attenuation in the cable. The camera tube along with the amplifiers is put in a weather proof case.

• **Coaxial Cable:**

It carries the video signal to the monitoring room. The characteristic impedance of the cable is 75Ω .

• **Video Amplifier at the Receiving End:**

Due to the attenuation in the coaxial cable, the signal level drops below the level required by the monitor. An amplifier is therefore used. The input impedance of the amplifier matches with the impedance of the cable. In case of several monitor, a distribution amplifier is used which feeds signal to individual monitor through matching pads. A monitor is a TV receiver without RF, IF and detector stages. Each monitor contains video amplifiers detection stages and a picture tube. The scene at which the camera tube was focused is display on the screen of the monitor. A signal monitor for several camera tubes can be used by employing a switching arrangement to switch the video signal from various cameras in an automatic sequence or manually as per need.



(ii) Describe three beam optical pickup assembly with the help of neat diagram.

Ans:- (Diagram: - 3M, Explanation: 3M)

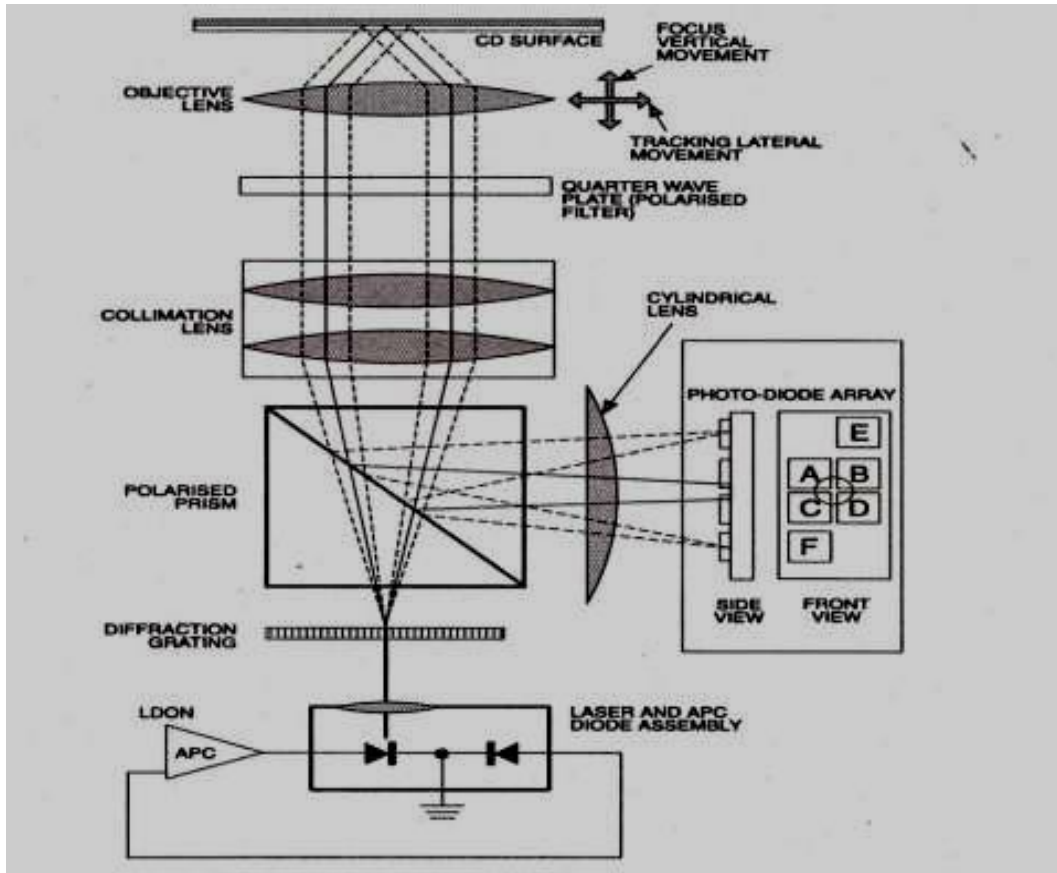


Figure: - Three beam optical pick-up assembly is used in CD player.

Explanation:

- This type of optical assembly is used in the most of the current VCD players. In these units ,three laser beams are generated from a main laser beam ,the main or center beam provides data retrieval as well as focus error information and two side beams provide tracking error signal.
- In this assembly the objective lens can move vertically to achieve focus, and laterally (horizontally) for tracking, i.e. to move to the center of track.
- In this assembly, the laser diode produces only one laser beam, other two beams are obtained from this single beam by using a diffraction grating.
- As the lens has limited amount of lateral movement, the complete assembly is moved gradually across the surface of the disc to read the signal on the VCD surface.



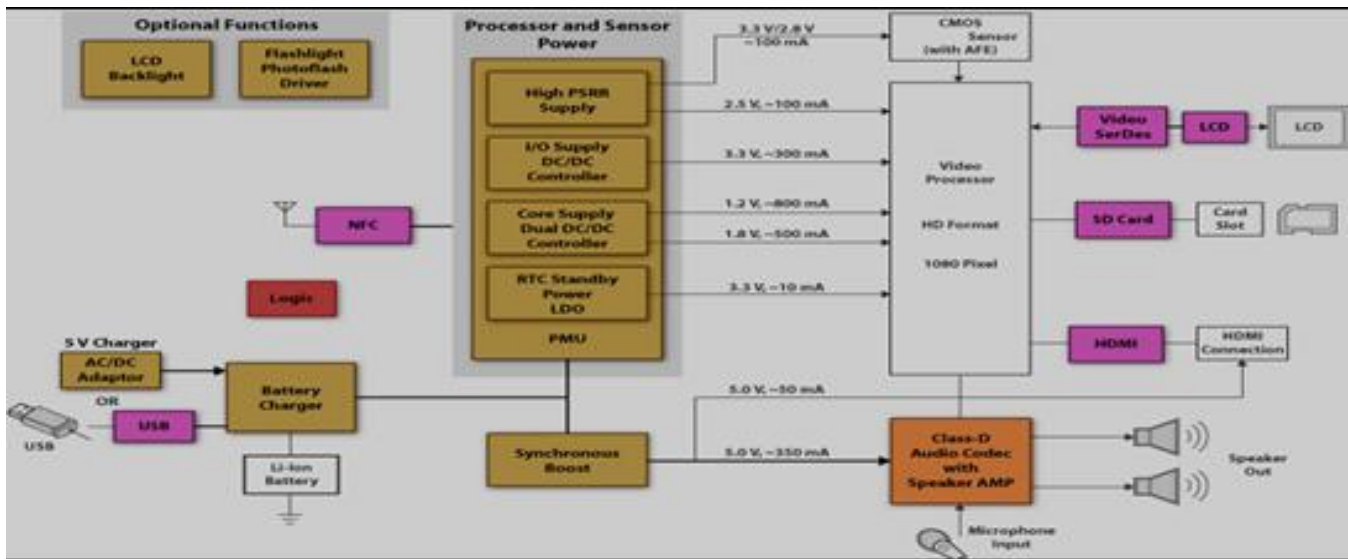
Q. 2 Attempt any TWO of the following.

16M

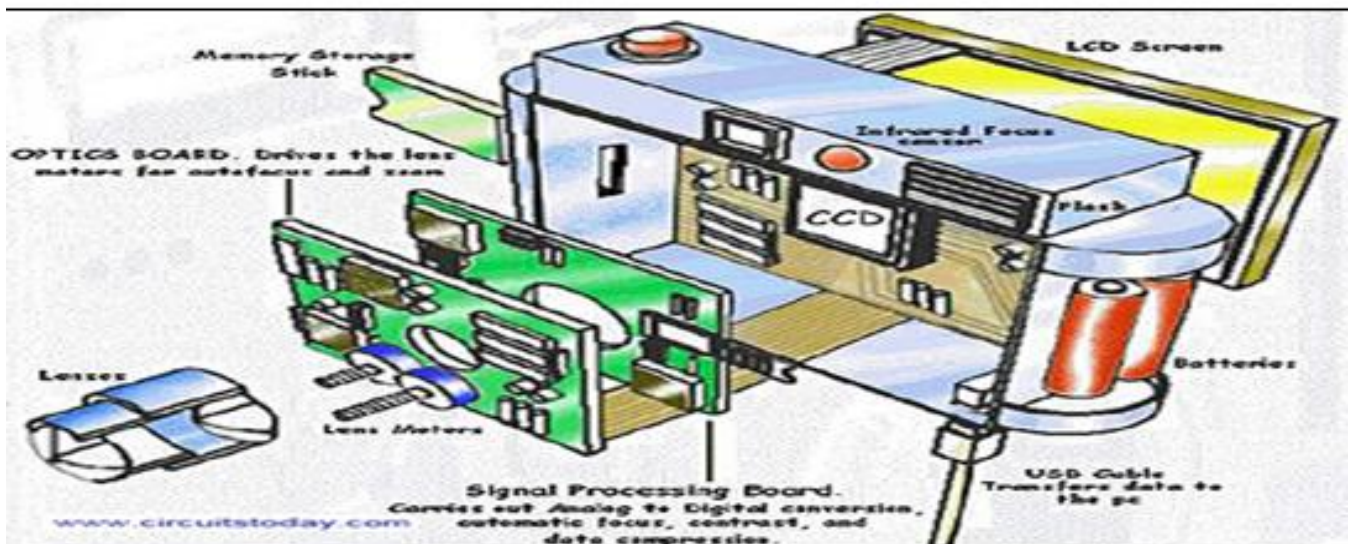
a) Draw block diagram of camcorder and state the function of each block.

Ans:- (Block Diagram : 4marks. explanation :4marks)

[Note: Marks should be credited if students draw any equivalent diagram which shows lens optical assembly, signal processing unit, memory storage, USB point and battery section]



OR



Camcorders have three major components: lens, imager and recorder.

- The **lens** gathers light, focusing it on the imager. The lens is the first component of the light path



- The **imager** (usually a CCD or CMOS)sensor converts incident light into an electrical signal. The imager converts light into an electrical signal. The camera lens projects an image onto the imager surface, exposing the photosensitive array to light. This light exposure is converted into an electrical charge. At the end of the timed exposure, the imager converts the accumulated charge into a continuous analog voltage at the imager's output terminals. After the conversion is complete, the photosites reset to start the exposure of the next video frame.
- The **recorder** converts the electrical signal to video, encoding it in a storable form. The lens and imager comprise the "camera" section.
- The recorder writes the video signal onto a recording medium, such as magnetic videotape.
- All camcorders have a recorder-controlling section, allowing the user to switch the recorder into playback mode for reviewing recorded footage, and an image-control section controlling exposure, focus and color balance.
- Signal processing unit does analog to digital conversion, automatic focus, contrast and data compression.

b) Draw the labeled block diagram of Blu-ray disc player and describe the function of the block.

Ans:- (Block Diagram : 4marks & Explanation :4marks)

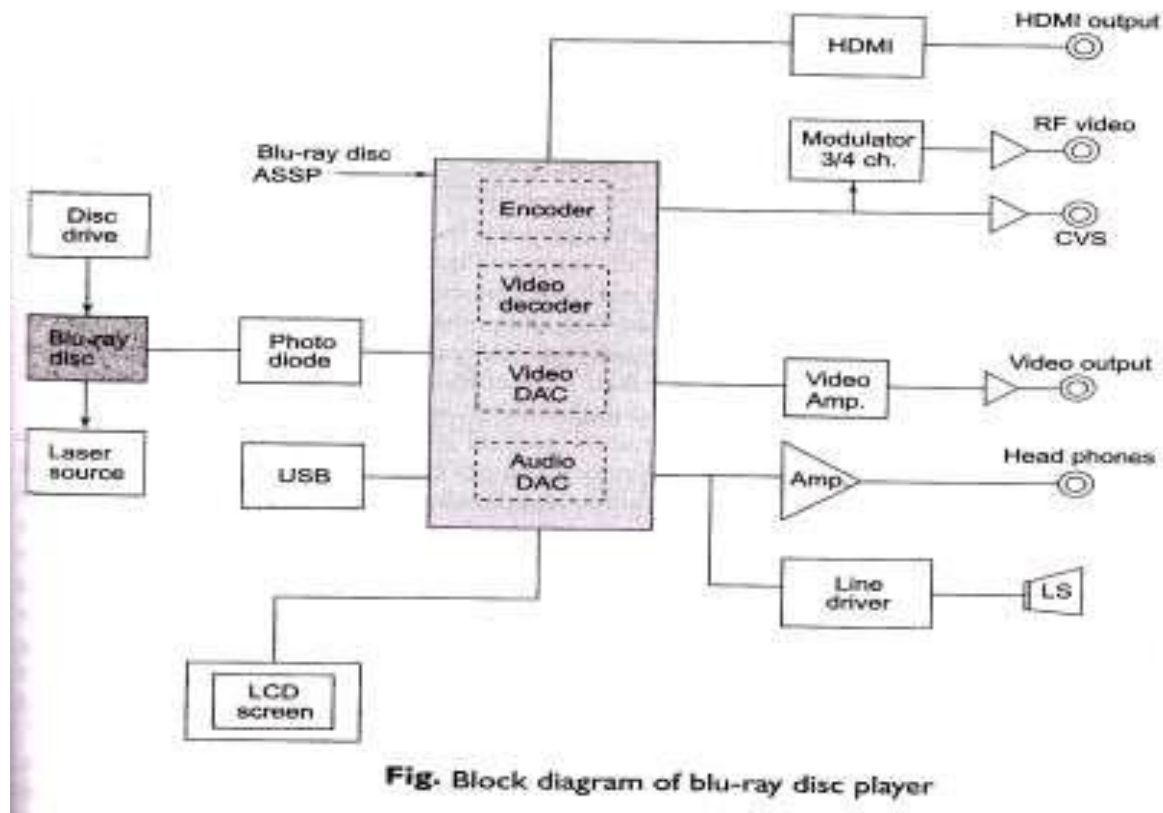


Fig. Block diagram of blu-ray disc player



OR

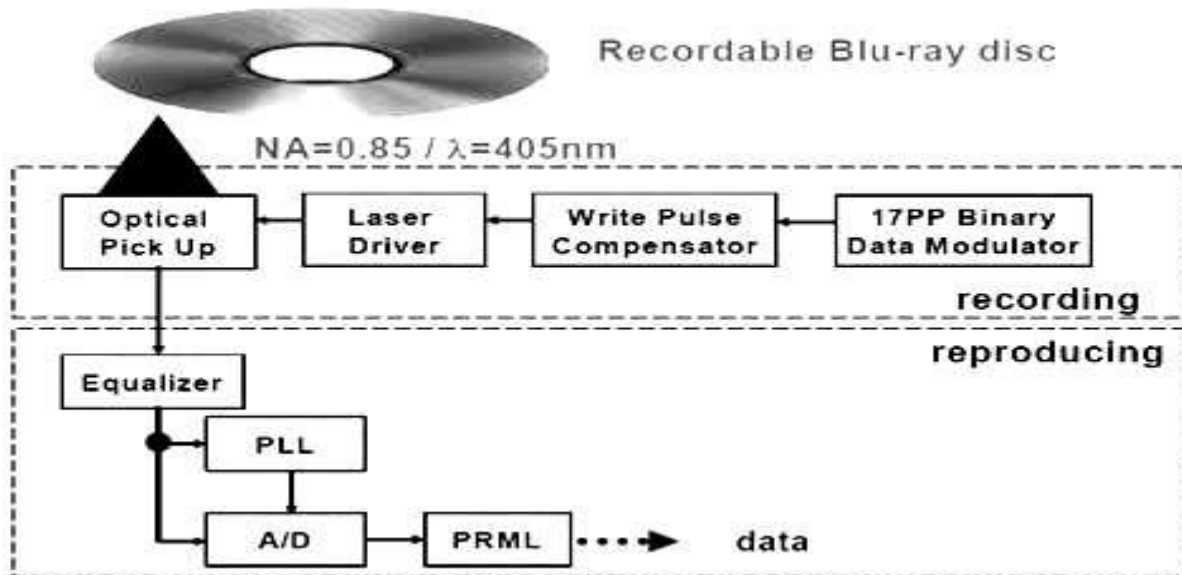
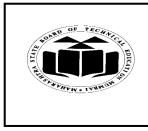


Figure:- Block Diagram of Recordable Blue-ray disc

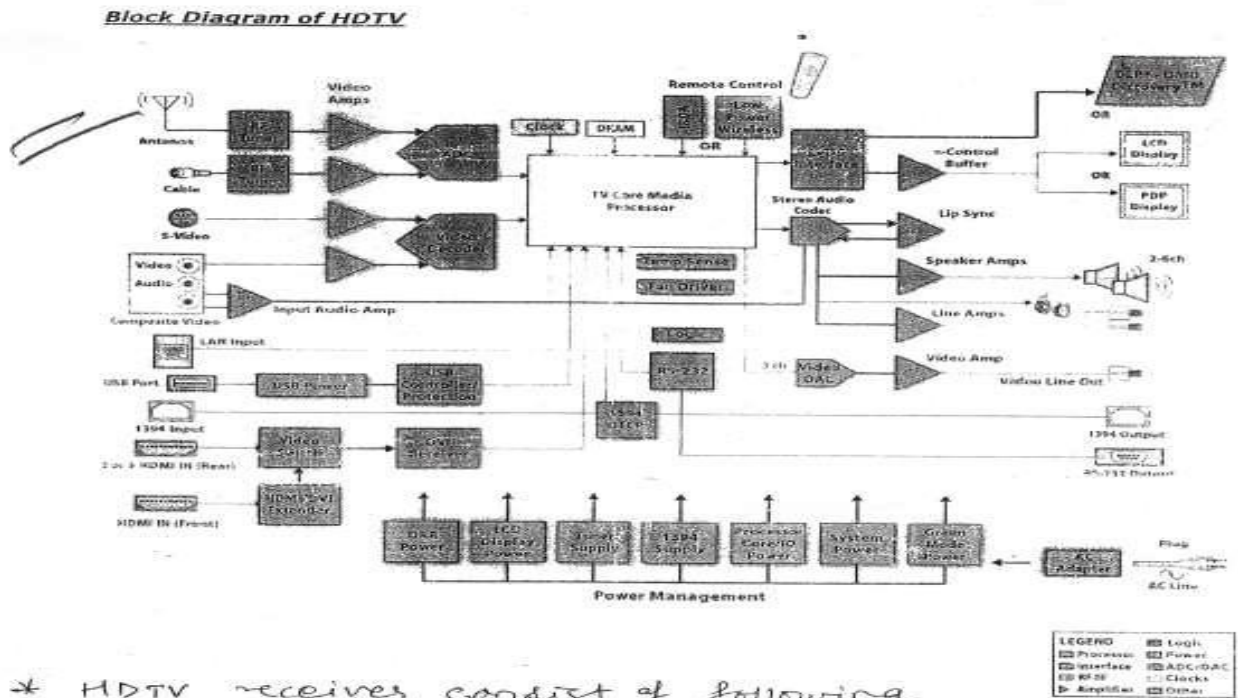
- A source of light (laser) is a light emitting diode (LED), made of gallium nitride semiconductor, which emits coherent light in blue-violet range at 405nm. This light is incident on the blu-ray disc which is driven by a synchronous motor through a device called disc drive. The disc has billions of pits and lands or flats. Pits do not reflect light, which is reflected by lands only. Thus the outcome of the disc consists of logic 1s and 0s. The digital pulses of light are detected by the photodiode which converts optical pulses into pulses of electric current. The pulses can be easily re-conditional to give amplitude of pure logic 1 and logic 0 (removing the deformations caused by lenses).
- The electric pulses pass through an application specific standard product (ASSP) processor designed specifically for blu-ray discs. The ASSP is an integrated circuits containing decompress or decoder and digital to analog convertors. For a digital receiver, the decompressed and decoded pulses from ASSP modulate RF carrier using phase shift keying. The modulated signal pertains to the frequency of third and fourth channel of TV receiver.
- The one which is not being used in local broadcast maybe selected. The TV receiver will process the signal to finally give analog output of sound and picture. The outputs from ASSP are also available in the baseband form, using DAC's for activating the monitors of the player.
- For analog receiver, the decoded signal is converted into an analog signal modulated by analog modulator to convert it into an RF modulated signal for 3rd and 4th channel of TV receiver.
- The BD player is so designed that it compatible with DVDs, so that the DVDs can be played on BD player.



c) Draw block diagram HDTV and state the function of each block.

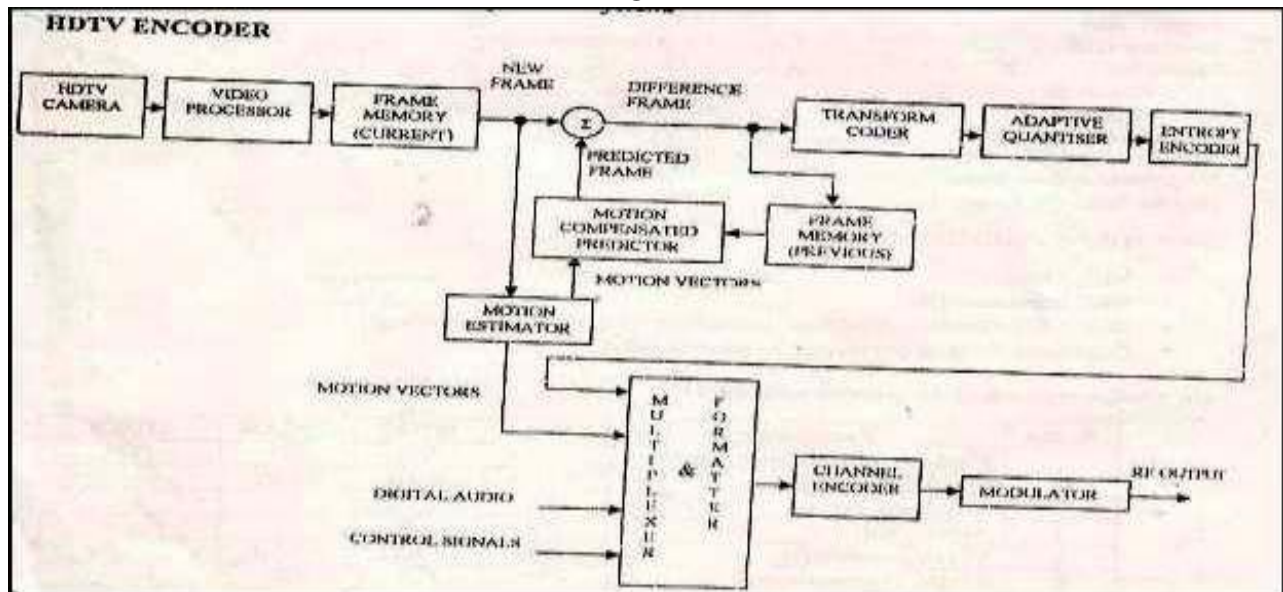
Ans:- (Block Diagram : 4marks & Explanation :4marks)

[Note: Marks should be credited if students draw any of the above diagram]



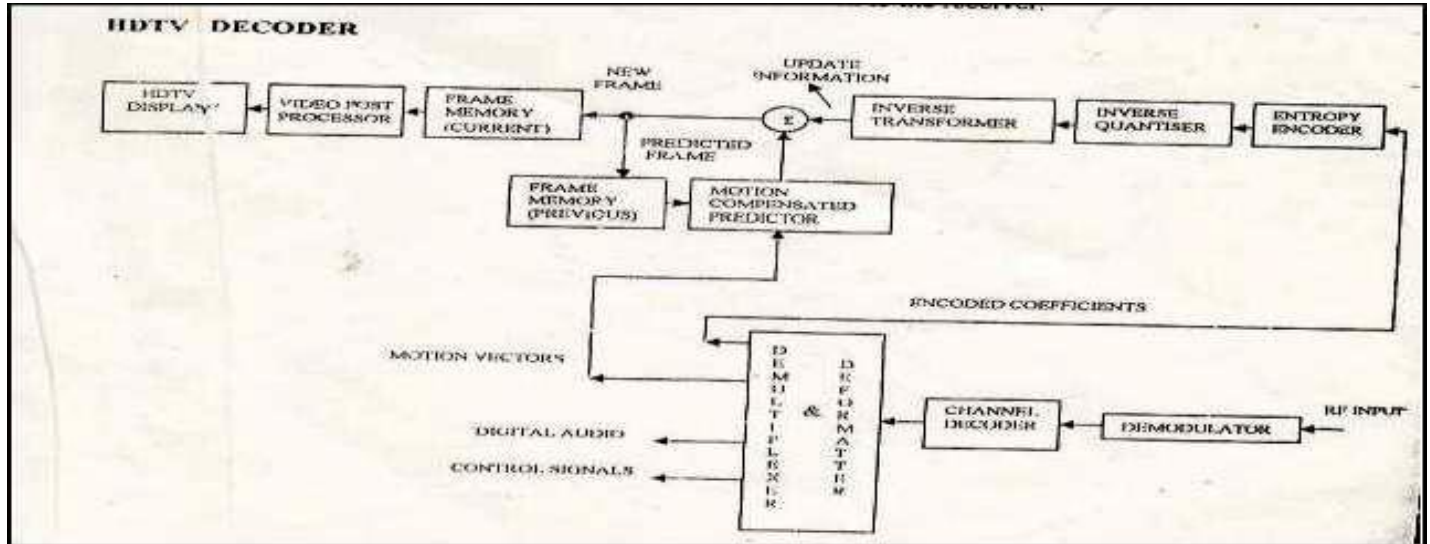
* HDTV receives consist of following section.

OR

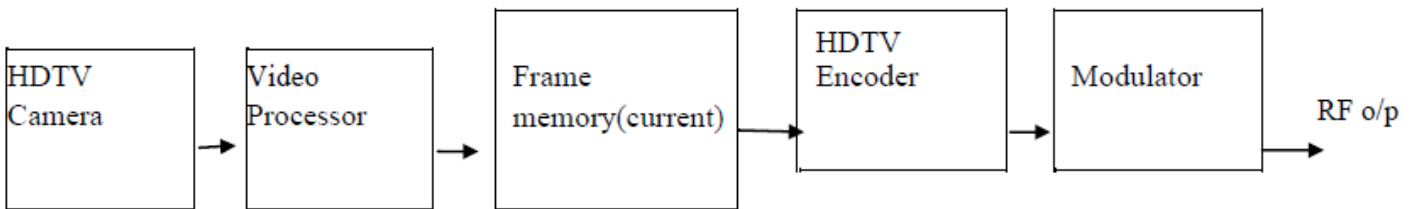




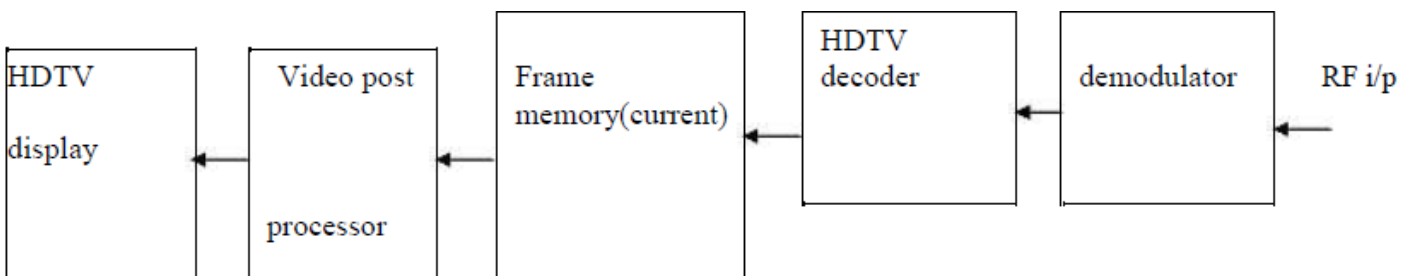
OR



OR

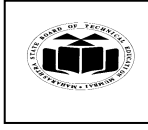


OR



Basic Function :

- The picture captured in HDTV camera tube is video processed which after being suitably processed it is in the frame memory (current) and referred to as new frame. A predicted frame is generated by past frames accumulated in the frame memory (previous). A difference frame is obtained by subtracting the predicted frame from the new frame since the predicted frame closely represents the new frame, there is little information left to be transmitted in the difference frame. This is the first step in video compression.
- Compression, of the video signal is achieved by using:



- i) A transform coder
ii) Entropy encoding which takes advantage of redundancy in the signal obtained at the output of the transform coder.
- The coded signals along with the digital audio & control signals are multiplexed.
 - To take care of error during transmission the output of the multiplexer is passed through the channel encoder. The final signal which feeds the modulator.
 - RF signal is demodulated in the demodulator
 - Channel decoder corrects any errors that occurred during transmission.
 - The De-multiplexer separates out encoded signals, motion vectors, digital audio & control signals
 - The encoded signals are processed in an inverse manner recovering the decompressed signals. This is the update information.
 - The update information is added to the predicted frame to reconstruct the new frame.
 - The new frame signals are fed to the HDTV display after suitably processed in the video processor. Here the high quality images are finally displayed

Q3. Attempt any FOUR of the following

16M

a) List the application of CATV.

Ans:- (1 M Each Application)

Applications of CATV: (Any 4)

1. As Television broadcast system
2. Cable internet modem.
3. Education
4. FM Radio broadcasting.
5. Program on demand broadcasting from cable operator.
6. Video-Tex
7. Cable phone
8. E-business
9. Local advertising

b) Describe the principle of projection TV to get large screen.

Ans:- (Diagram: - 2M, Principle:- 2M)

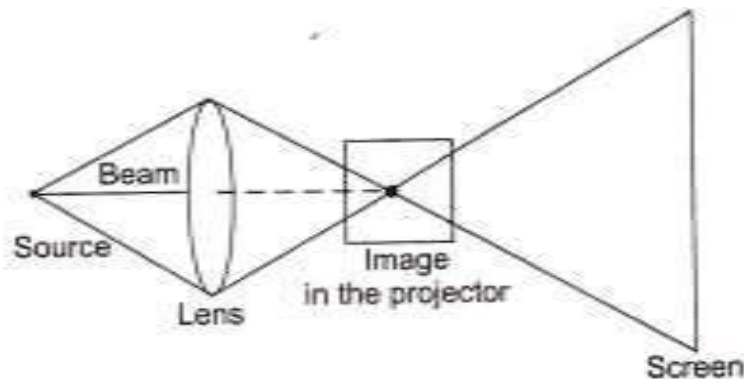


Fig Display of projection TV by transmission method

OR

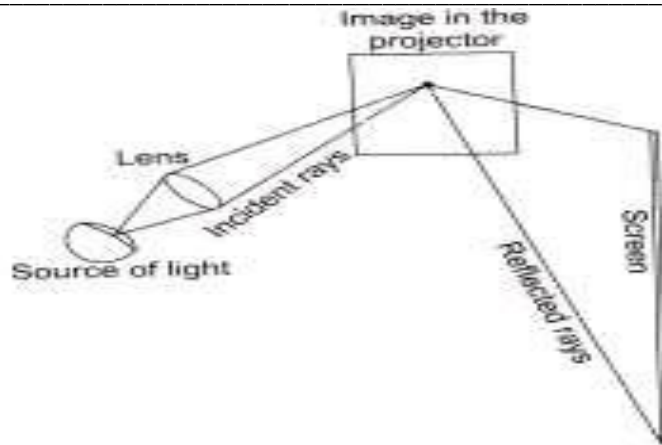


Fig Display of projection TV by reflective method

- The projection TV uses a projector to create small images into large images as output on screen. There are two types of projections front projection & rear projection.
- Projection TV uses beams of bright light and magnifying lenses & project on the screen's front or back by either transmission or reflection.

Transmission Technique: -In this type of projectors small CRT's or small LED's are used. Three small sized are used to create small pictures by making phosphor elements glow when the electron beam whose strength varies as per video signal, strike the phosphor's beam from a source of light is focused on this small image by a magnifying lens. The rays coming out of the image diverge and reach the screen creating magnified image. Small low cost LCD can also be used in place of CRT's.

Reflective Technique:- This technique uses Digital light processing (DLP) device which contains millions of micro mirror's, integrated on a small chip. There is a mirror for each pixel. The chip is known as digital micro mirrors device (DMD). When the mirrors point towards the lens, the reflected lights reaches the lens, and when they are away from the lens, there is no light coming to lens. The mirrors are moved as per the video signal pulses.

c) Compare plasma and CRT display technology.

Ans:- (Any four points 1 M each)

SR NO	PARAMETERS	PLASMA	CRT
1	Screen Size	Average screen sizes range from 32 inches to 63 inches.	CRT TVs are limited to about a 40-inch screen size
2	Viewing Angle	Higher viewing angles [178 degrees]	They can be viewed from any angle in any light
3	Weight	Plasma displays are fairly heavy, and may need additional supports to be mounted onto a wall	They weight more than LCD and Plasma TVs.
4	Frame rate	typically 60–85 fps	typically 60–120 fps
5	Refresh rates	High	Low
6	Life span	about 100,000 hours	over 80,000 hours.



7	Energy consumption and heat generation	Varies with brightness	High
8	Brightness / Contrast	Plasma TVs report higher brightness and contrast levels	CRT TVs tend to have good contrast ratios
9	<u>Color depth</u>	6 to 8-bit per sub pixel panels	24-bit per pixel
10	Electro-magnetic radiation emission	Emits strong radio frequency electromagnetic radiation	Can emit a small amount of X-ray radiation.

d) Describe the specification of monitor.**Ans:- (01M each)****Specifications of monitors: (Any four)**

- 1. Panel Size:** Panel size is a simple topic, it refers to the physical size of a panel. While the bezel (outer edge) of the monitor will make it slightly larger than the actual panel size, it's no more than 1 to 2 Inches. Panel size is measured diagonally, corner to corner.
- 2. Aspect Ratio & Resolution:** Aspect Ratio is related to the ratio of the image in terms of its size in correlation to the height vs the width. The aspect ratio can be determined by considering the ratio between horizontal and vertical pixels. Common aspect ratios are 4:3 and 16:9 which are both used for TV Broadcasting.
- 3. Resolution:** It is the number of distinct pixels in each dimension that can be displayed. All LCD's have a certain number of pixels making up their liquid crystal matrix, and so each LCD has a "native resolution" which matches this number.
- 4. Response Time:** Response time is the measured rise time (tR) and fall time (tF) of a pixel as it changes black > white > black. This is effectively the time it takes to change a pixel from one color to another and the total response time should be quoted as the total of the tR + tF.
- 5. Contrast Ratio:** Contrast Ratio of a TFT is the difference between the darkest black and the brightest white. As a rule of thumb, the higher the contrast ratio, the better. On modern monitors you want to look for the "Static Contrast" which won't be more than 1000:1 on modern monitors.
- 6. Brightness:** Brightness is a measure of the brightest white the TFT can display. Brightness is measured in Candela-per-square-meter (cd/m^2).
- 7. Backlighting:** There are 3 Primary Types of backlighting. CCFL (Cold Cathode Florescent Lamps) W-LED (White LED) and RGBLED (Red, Green, & Blue LED.) Each has their own benefit and drawback.
- 8. Viewing Angles:** Viewing angles are quoted in horizontal and vertical fields and often look like this in listed specifications: 170/160 (170° in horizontal viewing field, 160° in vertical). The angles are related to how the image looks as you move away from the central point of view, as it can become darker or lighter, and colors can become distorted as you move away from your central field of view. Because of the pixel orientation, the screen may not be viewable as clearly when looking at the screen from an angle.



9. **Refresh Rate:** TFT screens do not refresh in the same way as a CRT screen does, where the image is redrawn at a certain rate. A TFT monitor will only support refresh rates coming from your graphics card between 60Hz and 75Hz. Anything outside this will result in a "signal out of range" message or similar. The "recommended" refresh rate for a TFT is 60Hz, a value which would be difficult to use on a CRT. The "maximum" refresh rate of a TFT is 75Hz, but usually if you are using a DVI connection the refresh is capped at 60Hz anyway
10. **Color Depth & Reproduction:** Color Depth is like Accuracy Color Reproduction is Precision. The color depth of a TFT monitor is related to how many colors it can produce. The more colors available, the better the color range can potentially be 8Bit Color Depth allows a total of 16.2 million reproducible colors. This is the most common color depth to find on most monitors.
11. **Pixel Pitch:** The pixel pitch of a TFT is related to the distance between pixels. Pixel pitch is normally listed in the manufacturers specification. Generally you need to consider that the 'tighter' the pixel pitch, the smaller the text will be, and potentially the sharper the image will be.

e) List the application of projection TV.

Ans:- (Each application 1 M)

Application of projection TV:- (any 4)

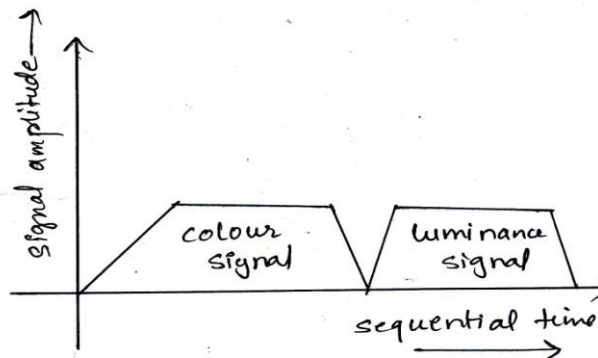
- Conferences
- Exhibition
- Public meeting
- Mini video theatre
- Educational institutes

Q 4.a) Attempt any **THREE** of the following:

12M

i) How is the problem of cross talk interference removed in HDTV.

Ans:- (Diagram:1mark, explanation :3marks)



In HDTV, TDM technique used eliminates mutual interference between colour & luminance as they appear separately from each other in time frame . In conventional TV, they are interleaved & so appear in



between each other. Chroma signal lie in between luminance signal and vice versa, favorable energy distribution for two signal for interleaving bit of overlapping does occurs and causes an interference, called 'crosstalk' on the analogy of interference between two channels. This crosstalk becomes more apparent when the picture of conventional TV System is presented on side dimension.

The TDM technique used in HDTV is called multiplexing analog components or MAC technique. which eliminates the problem of cross talk interference in HDTV.

ii) Illustrate the working of LED module in Jumbo TV screen.

Ans:- (Diagram:1mark,explanation :3marks)

- In a jumbo TV, red, green and blue LED's are used instead of phosphor.
- A "pixel" on a jumbo TV is a small module that can have as few as three or four LED's in it (one red, one green and one blue) .in the biggest jumbo TV's ,each pixel module could have dozens of LED's .pixel modules typically range from 4 mm to 4 cm in size.
- To build a jumbo TV, thousands of these LED modules are taken and arranged them in a rectangular grid.
- For example, the grid might contain 640 by 480 LED modules, or 307,200 modules. the size of the ultimate screen
- Depends on the size of the LED modules.

LED Module size	Screen size(meters)	Screen size(feet)
4 mm	2.56 x 1.92	8.4 x 6.3
25 mm	16 x12	52.5 x 39.4
40 mm	25.6 x 19.2	84x 63

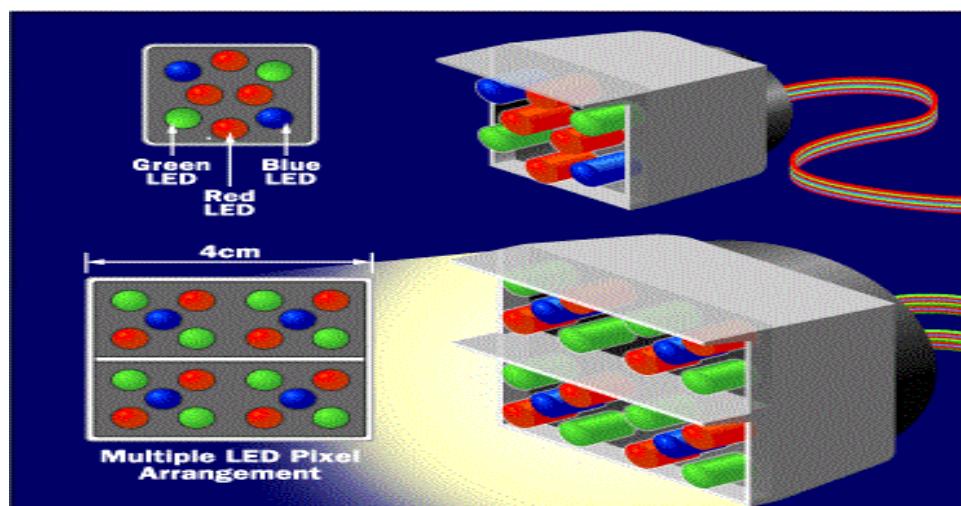


Diagram of LED Pixels module

iii) List the different equipment used in production studio and state their function.



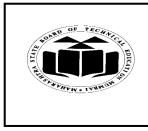
Ans:- [Note: (listing of different equipment -1marks,Very brief function of any 3 equipment -1mark each)]

Listing of different equipment:-

- Cameras
- Spot lights
- microphones
- video recorders
- monitors
- special effects generator
- Switcher

Functions:-

1. **Cameras:** camera control room or the main equipment room is located in the studio complex, generally close to the PCR. Its management is looked after by a TV engineer.
2. **Special Effects Generator(SEG):** Special effects generator (SEG) produces special effects in a picture it provide an electronic gate for special effects.SEG stores picture frames into the memory and it can reduce the size for superimposing a small picture over another scene through a switcher.
3. **Switcher:** The function of a switcher is to switch signals from different sources it typically selects 10 inputs sources and 6 output lines with the help of a 10 x 6 matrix .The input sources are various cameras, tape recorders and test signal generators. Signal of various cameras is done by an electronic switch which is fast and is without spurious or transient pulse (called glitch).Switching facilities editing and insertion of captions editing includes facilities like take, cut, fade-in, fade-out and mixing to give special effects in addition to the effects obtained from memory of the SEG.
4. **Studio lights:** The art form of the reproduced picture depends on the lighting arrangement which needs to be very elaborate and should therefore be planned carefully.
5. **Microphones:** Microphones converts sound pressure variations into electrical variations, called audio signals. There are several types of microphones like moving coil type, ribbon type, special noise cancelling microphones, etc. Microphones used in program involving public interviews, speeches, musical concerts may be kept to the viewers, but in drama serials, they are kept out of the view. Hidden microphones and boom mounted microphones are frequently used for such programs.
6. **Tele-cine Equipment:** A cinema film is a reel of photographic films, usually of 35 mm or 16 mm size. Special techniques are used to convert photographic films into video signals.
7. **Control of reverberation in a TV:** Sound being a wave motion suffers reflection, diffraction and absorption in accordance with the specified rules as for any wave motion. A listener in an auditorium receives sound directly from the source as well as sound reflected from walls, ceiling and floor. The reflected sound will be heard as a distinct echo if time gap between the direct wave and the reflected wave is more than 60 ms. Reflections over shorter distances shall simply prolong the sound. Due to multiple reflections coming at different instances of time due to path differences, sound persists even



after the source of sound stops sounding, it fades away only gradually. Such gradual fading of sound is called reverberation. Reverberation time is defined as the time taken for the sound energy to drop to 10-6 times its initial value.

iv) Draw block diagram of MAC encoder and state the function of each block.

Ans:- (Diagram 2M, Brief explanation 2M)

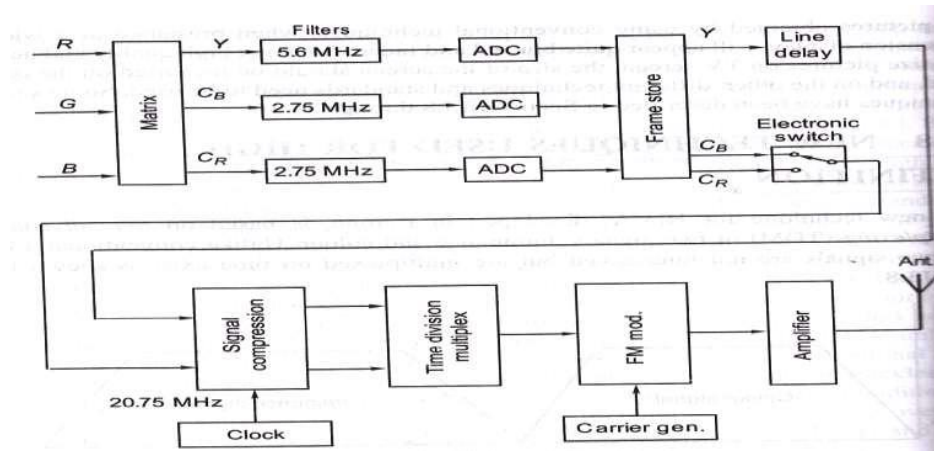


Figure:- Block diagram of MAC(multiplexing analog component) encoder

Functions of MAC coder:-

- **Matrix:** -Video signals, R, G, and B, produced by the colour camera tubes represent the intensity of light of three primary colours, red, green, and blue, present in each pixels of the picture. These signals are fed to a resistive matrix, incorporating resistor circuits, invertors and adders (as in the conventional TV system) to give luminance signal $Y(=0.11 B+0.30 R+0.59G)$, and duly weighted colour difference signals designated as CB (for weighted B-Y) and (for weighted R-Y).
- **Filter:**-These are band pass filters, allowing bandwidth of 5.6 MHz for Y signal and 2.75 for CB and CR signals. (These bandwidths are different from the bandwidths used in the conventional TV system and form part of new standards for HDTV.)
- **Analog to digital converter:**-The filtered signals are sampled for digitization. The minimum sampling rate is equal to twice the maximum bandwidth frequency. The samples are coded as 8-bit codes, producing a word of 8 bits for each sample of the analog waveform taken.
- **Frame store:**-The frame store isolates the input and the output and hence synchronization is not required.
- **Line delay:**-Luminance signal Y is delayed by one line. This is achieved by using two RAMS, one for storing one line. This is achieved by using two RAMS, one for strong luminance signal for the current line (the line which is scanning) and the other for the previous line (the line which has just been scanned). This automatically synchronizes the sequence of the luminance signal and the Chroma signal.
- **Line sequential switch:**-It is an electronic switch which allows CB signal odd numbered lines and CR signal on even numbered lines, as in the SECAM system.



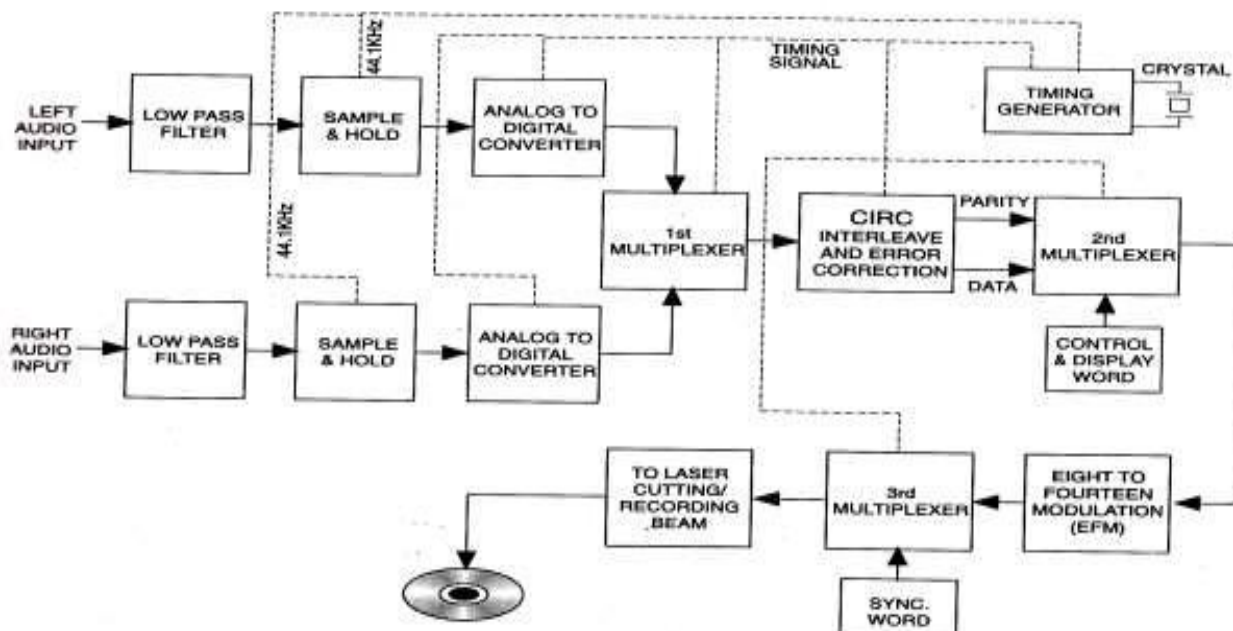
- **Comparison stage** :-The luminance signal, clocked (or sampled) at 13.5MHz and 20.25 MHz comparison ratio for U and V is 3:1 and for Y, 3:2.
- **Time Multiplex Switch**:-This is the final stage of MAC encoder. The Y and C signals are multiplexed so that odd line contains Y and CB signal.
- **Frequency Modulator**:-The multiplexed signal modulates a sine wave carrier, using frequency modulation and thus , we get a modulated signal duly multiplexed for Y and C.
- **Final Power Amplifier**:-It finally amplifies the power and delivers it to the transmitting antenna.

b) Attempt any ONE of the following:

06M

- i) Draw block diagram of CD encoding process and state the function of each block.

Ans:- (Block diagram of CD encoding process :3marks ,explanation:3marks)



Function of each block:-

- **Low pass filter** –In CD player the signals are first send to low pass filter to remove unwanted frequencies for e.g. In audio signal frequency above 20KHz are removed. The filtered signal is fed to sample and hold and A /D convertor.
- **Sample and Hold circuit** samples the input signal at fixed intervals. Each sample value sampled is held in this circuit for a brief period to convert the sampled value into binary coded signal.
- **A/D convertor** samples analog signal to 16 bit or 32 bit word. The output of A/D convertor is sent to multiplexer which takes number of input signal and transmits them over one single path.



- **Interleaving** is a method to improve the error correction capability of CD. When interleaving is used, the order of the data to be stored on disc is changed. To achieve interleaving, the data words are sent through a series of delays before writing them to the disc.
- Before writing the data on CD, after error detection and correction the bits are added to the data stream, and the interleaving operation is done, the data word is mixed with another 8-bit word known as the control/display word". After the control words are added to the data words, the signals, before sending them to the laser beam that writes them to the CD, are passed through another circuit known as "**Eight To Fourteen Modulator**" or **EFM circuit**.

Before writing this digital information to the disc the final information added to the data stream is the Sync words.

ii) Draw block diagram of DTH receiver and state the function of each block.

Ans:- (Block diagram of DTH receiver:3marks ,explanation:3marks)

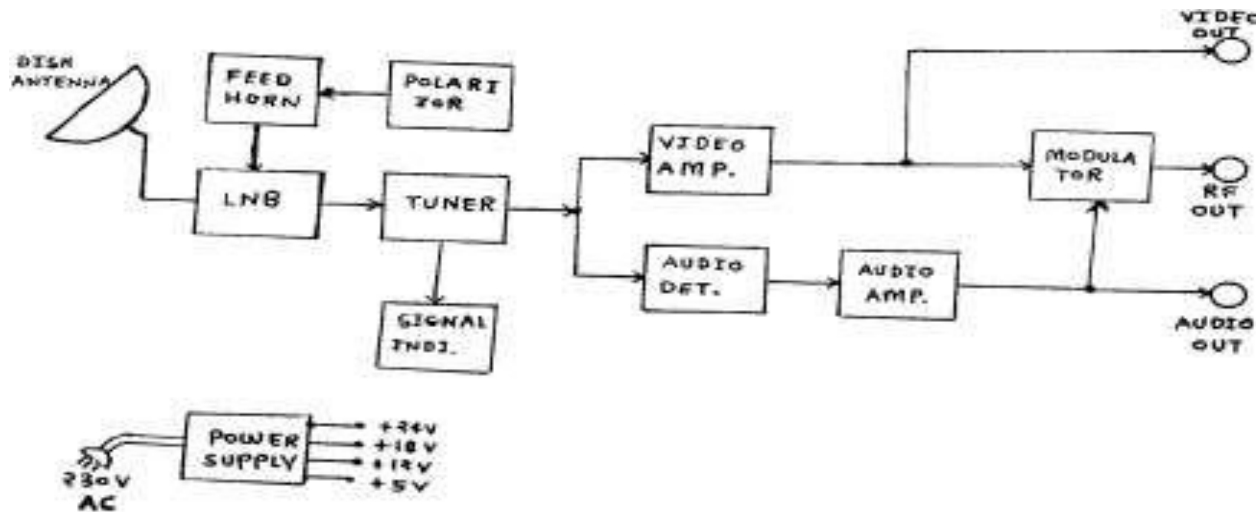


Figure:- Block diagram of DTH receiver

Explanation:-

It consists of following stages:

1. Dish antenna and lnb (low noise band converter) section:-

The feed horn collects microwave signals reflected from the antenna surface and ignores noise and other signals coming from off-axis directions. Then LNB amplifies the signal received through feed horn and converts its frequency from 11.7 to 12.2 ghz to 1.450 to 0.950 ghz. Thus it down converts frequency. It also converts microwave signals into electrical signals.

2. Tuner Section:-

The down converted signal from LNB is given to Tuner of Receiver amplifier through co-axial low loss cable. The received signal is amplified by the R.F. Amplifier and further converted in the mixer amplifier stage to yield the intermediate picture and sound I.F. signals (Composite I.F. Signal) by heterodyning with local Oscillator frequency. Tuner also incorporates Video IF amplifier and detector.



The output of Tuner is the MPEG Baseband signal which consists of Video signal and Sound signal in compressed form.

3. MPEG DECODER:-

The output of DTH Tuner, the MPEG Baseband signal, is applied to MPEG decoder which encodes audio and video signal.

4. Video Amplifier:-

The base band signal is applied to video amplifier. This section amplifies Video signal and final amplified signal is given to the R.F. modulator and Video out Socket.

5. Sound I.F. And Audio Amplifier:-

The base band signal is applied to sound IF and Audio amplifier subsystem. This system amplifies and detect the sound I.F. Then IC 741 is used for further amplification of obtained audio. The final amplified signal is given to the R.F. modulator and Audio out Socket.

6. R.F. Modulator Sect:-

It modulates Audio and Video signals obtained from above sections and converts into R.F signal for Channel-2. This R.F. output is then connected to the antenna input of T.V receiver.

7. Power Supply Section:-

R.P.S. stage provides the different DC voltages required for various stages of receiver viz. +3.3V, +5.0V, +12V, +22V and +30V.

Q 5. Attempt any FOUR of the following:

16M

a) How data storing capacity is enhanced in DVD?

Ans:- (Explanation-04M)

The technique used in DVD's to increase its capacity to hold large information are as follows:

1. The real breakthrough in enhancing the capacity of laser disc came when laser of smaller wavelength was used. In DVDs, red light laser was being used 635 nm. for professional use an 650 nm. For commercial use. This wavelength was lot smaller than the wavelength of 718nm (Infrared light) used in CDs .A smaller wavelength resulted in smaller spot. A sharper beam spot increased in capacity in two ways.
 - i. Adjacent tracks became closer allowing more tracks per disc .DVD track pitch was reduced to 0.74mm which is less than half of CDs (1.6mm)
 - ii. The pits where data is stored became much smaller than those in a CD. Minimum pit length in DVD is 0.4 mm only which is less than half of 0.834mm in CD. This allowed more pits per track.
2. Information can be scanned from more than one layer in DVD, simply by changing the focus of the laser beam. Instead of using an opaque reflective layers ,it is possible to translucent layer with an opaque layer behind it .while a single cannot be as dense as the first layer and therefore the capacity of two layers is slightly less than two time Of single layer by about (10%). The provision of two layers enables the user to use the DVD with higher capacity without removing it from the drive and turning over.
3. DVD allows double sided discs. Thinner plastic disc was required for the laser beam to focus on the smaller pit depths. This required only 0.6mm thick dick, just half thickness of CD. Such thin discs were rather too thin to with stand handling. Hence two discs were bounded back to back, making the whole discs 1.2mm thick. While bonding was necessary for rigidity, is doubled the storage capacity as two



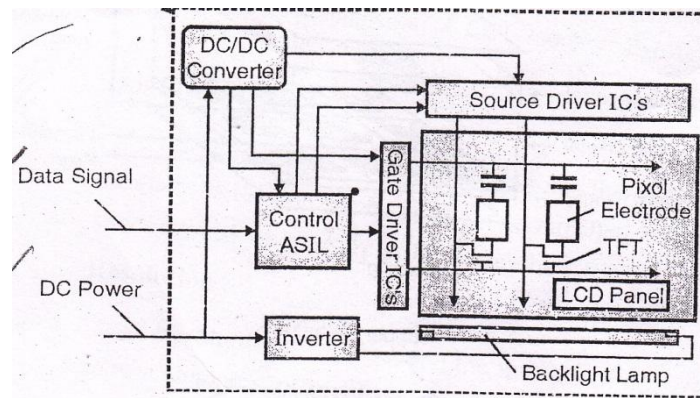
substrates could be used to record the data. (In single sided DVD also, bounding is used for strength, but the data is recorded on one substrate only, the other one remaining black.)

4. DVD uses more efficient error correction code (ECC). The bits used for error detection consume the space which otherwise could have been used to carry the data. Smaller the number of error detecting and correcting bits, less would be the space required for them and hence more would be the room for real data.
5. DVD uses the format of MPEG-2 (Moving Picture Experts Group of International Standards Organization) for coding and recording which gives higher quality than MPEG-1 used in CD.

b) Draw the block diagram of LCD monitor and state the function of each block.

Ans:- (Block dig 2M , Explanation 2M)

Diagram:-



The individual components (glass casing, liquid crystal, cell, alignment layer, conducting electrodes, and polarizers) are combined. Light entering the display is guided by the orientation of liquid of the liquid crystal molecules that the twisted by 90 degrees from the top plate to the bottom. This twist allows incoming light to pass through the second polarizer.

When voltage is applied, the liquid crystal molecules strengthen out and stop redirecting the light. As a result light travels straight through and is filtered out by second polarizer.

Consequently no light can pass through making this region darker compared to the rest of the screen. To display characters or graphics, voltage is applied to the desired regions making them dark and visible to the eye.

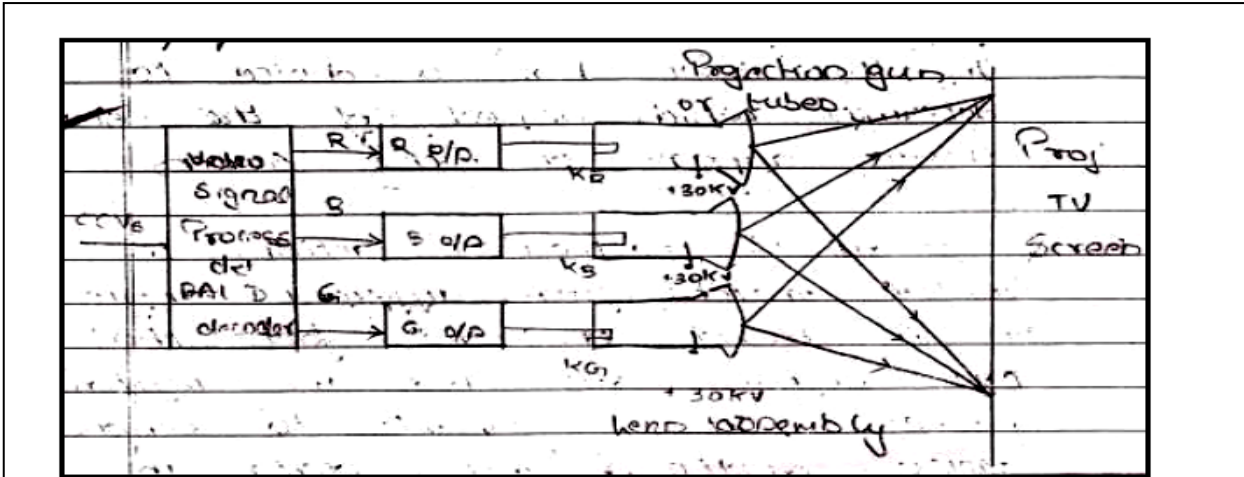
c) Draw the block diagram of projection TV and state the function of each block.

Ans:- (Block diagram- 2M , Explanation- 2M)

- **Explanation of projection TV:** -The projection TV uses a projector to create small images into large images as output on screen. There are two types of projections front projection & rear projection. Projection TV uses beams of bright light and magnifying lenses & project on the screen's front or back by either transmission or reflection.
- **Transmission Technique:** -In this type of projectors small CRT's or small LED's are used. Three small sized are used to create small pictures by making phosphor elements glow when the electron beam whose strength varies as per video signal, strike the phosphor's. Beam from a source of light is focused on this small image by a magnifying lens. The rays coming out of the image diverge and reach the screen creating magnified image. Small low cost LCD can also be used in place of CRT's.



- **Reflective Technique:-** This technique uses Digital light processing (DLP) device which contains millions of micro mirrors, integrated on a small chip. There is a mirror for each pixel. The chip is known as digital micro mirrors device (DMD). When the mirrors point towards the lens, the reflected lights reaches the lens, and when they are away from the lens, there is no light coming to lens. The mirrors are moved as per the video signal pulses.
- **Block diagram of projection TV:**



OR

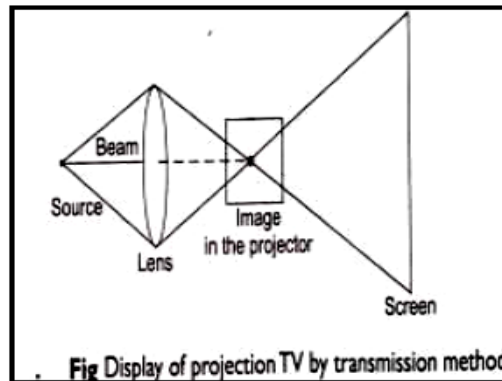


Fig Display of projection TV by transmission method

OR

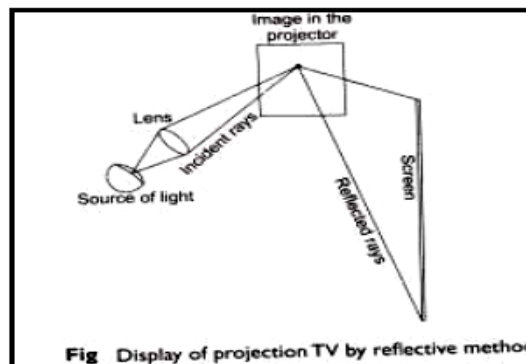


Fig Display of projection TV by reflective method



d) Describe how conditional access is provided in CATV.

Ans: (Explanation--4M)

- **Scrambling system:** The cable companies offer several local TV program for a minimum charge. In addition premium services on separate channels are offered which include cine-films, special sport events and many more. However, these premium channels require a fee to be paid that is added to the basic charge. For this the incoming signal is scrambled i.e. picture is an intelligible on the receiver screen unless de scrambled i.e. restored to its normal form with a signal supplied by the cable operator at the subscriber request with additional payment.
- **Sync separation scrambler:** The most common method of scrambling signal is known as sync separation. In this sync is only compressed in the RF modulation envelope of the video carrier in the cable channel then the receiver cannot lock in with the sync suppressed signal and the picture continuously rolls with horizontal tearing of its details .The descrambler unit reverses the effect of scrambling at the head end of the cable system by restoring sync to the RF signal.
- **Traps:** One method of blocking the serial is by inserting an interfering carrier in the pay channel and notching it out by a suitable sharp filter at the subscribers end. Such a method is easy to tamper and hence scrambling is more commonly employed for conditional access to a channel.

e) Draw the block diagram of two way cable system and state the function of each block.

Ans:- (Block dig 2M , Explanation 2M)

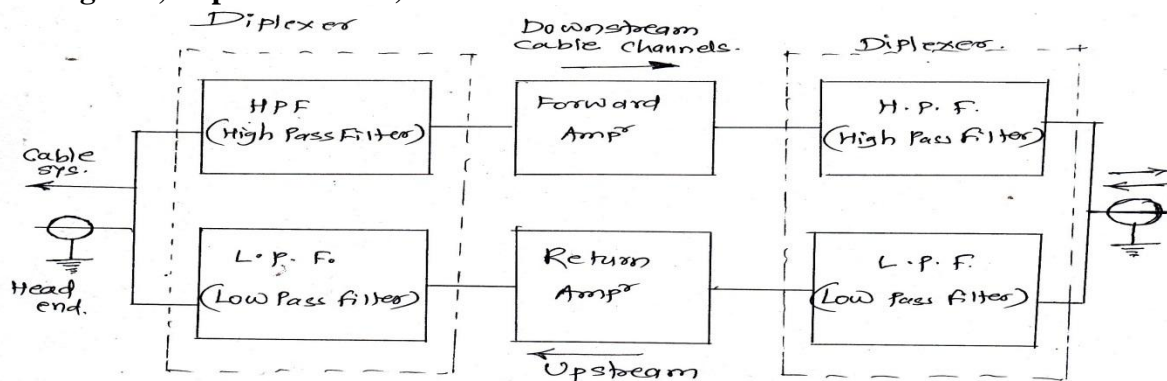


Fig: Two-way cable system.

- In addition to downstream signal from head end to each subscriber most cable system are designed for bidirectional i.e. Two way service; where the same cable is used for both directions.
- However separate amplifiers are used for upstream signals as shown in Fig. towards the head end, communication is in the 5-30 MHz band while the downstream transmission, to subscriber is around 50 MHz or higher. As shown in fig. directional H.P & L.P filters are used to keep the two paths dependent of each other.
- Two way application- The two way CATV system, enables communication with subscriber.
- For billing, market surveys shop at home service and pay per view for special programmes. Some city service origination, permit home bungalow & security systems to be connected to a central receiving station in the return line of the cable system.



Q 6. Attempt any FOUR of the following:

16M

a) Describe the following formats

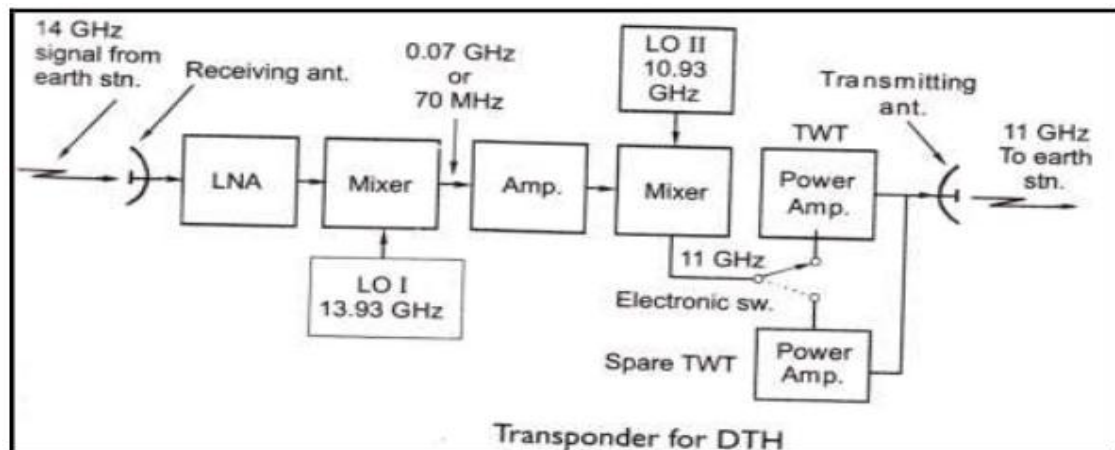
- i) BMP
- ii) PNG

Ans:- (2M each)

- i) **BMP:** The BMP file format, also known as bitmap image file or independent bitmap(DIB) file format or simply a bitmap, is a raster graphics image file format used to store bitmap digital images, independently of the device(such as a graphic adapter), especially on Microsoft Windows and OS/2 operating systems.
- ii) **PNG:** The PNG (Portable Network Graphics) file format was created as the free, open-source successor to GIF. The PNG file format supports 8bit palette images (with optional transparency for all palette colors) and 24 bit true color (16 million colors) or 48 bit true color with and without alpha channel-while GIF supports only 256 colors and a single transparent color.

b) Draw block diagram of transponder for DTH and explain its working

Ans:- (DTH Transponder: Diagram 2M, Function 2M)



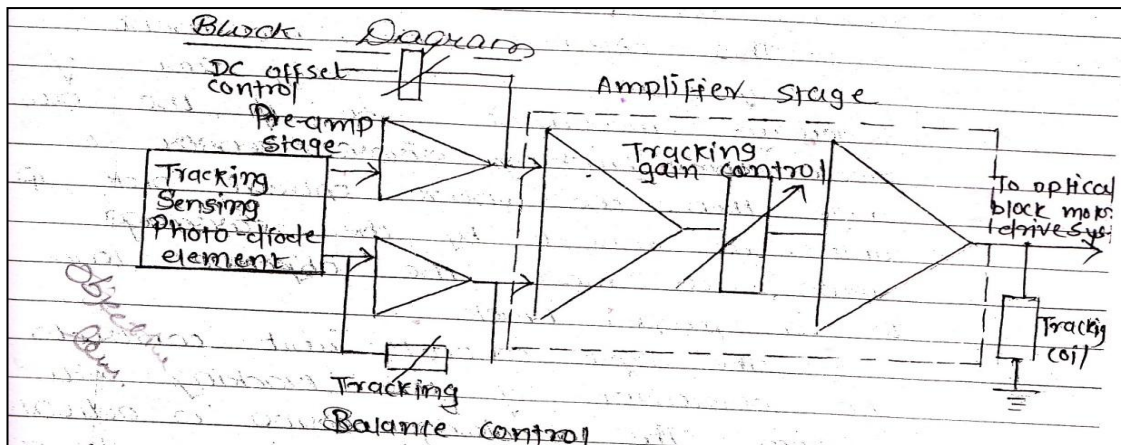
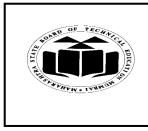
- The transponder in DTH system has to produce high power of about 100W.
- The transponder uses double conversion of the signal.
- The input signal is first down-converted to an intermediate frequency of 70MHz.
- Much higher gain of the signal can be achieved at 70MHz than at microwave frequency.
- The amplified output of the IF amplifier is now up-converted to the down-link frequency of about 11GHz for getting better output power , travelling wave tube (TWT) is used as a power amplifier.

c) What is the need of servo system in CD player? Illustrate the working of tracking servo system.

Ans:- (Need- 1M, Illustration with diagram- 3M]

Need of servo system:

- The servo systems are used to focus the laser beam to the CD surface. To move the optical pick-up assembly across the disc surface, to move the CD carrying carriage in and out of CD player and to rotate the CD carrying assembly.



- The servo system shown in figure enables the reading unit to move the objective lens sideways on the CD surface to work for the correct track on the disc surface.
- The laser beam reflects from the disc surface will generate a track error signal based on whether the objective lens is on the correct track or not.
- Any tracking error signal generated by the reading unit is amplified and sent to tracking coil, which will make the objective lens to move sideways until the correct tracking is achieved.
- This objective lens movement is very small, around 2mm of sideways movement. So if the output from the tracking error sensor is large then the entire optical pick up unit is moved by the carriage servo to move the objective lens to a proper track
- The system control unit controls the operation of the tracking servo system. The tracking servo is activated only after the system has switched on the laser beam, the correct focusing is achieved and the CD starts rotating at the correct speed.

d) Compare LED and LCD monitor. (any four points)

Ans:- (Any valid four points 1M each)

LCD	LED
1. Source of light used is the florescent lamps	1. Source of light used is LED
2. Produces high quality image	2. LED's give more balance in colour resolution.
3. Florescent lamps are arranged in a grid form.	3. The service of diodes are arranged in several rows.
4. use less power	4. Use less power than LCD.
5. They can be made very thin making them less space consuming.	5. They cannot be very thin.



e) State two merits and two demerits of plasma display

Ans:- (Merits:-2M & Demerits:-2M)

• **Merits: [Any two]**

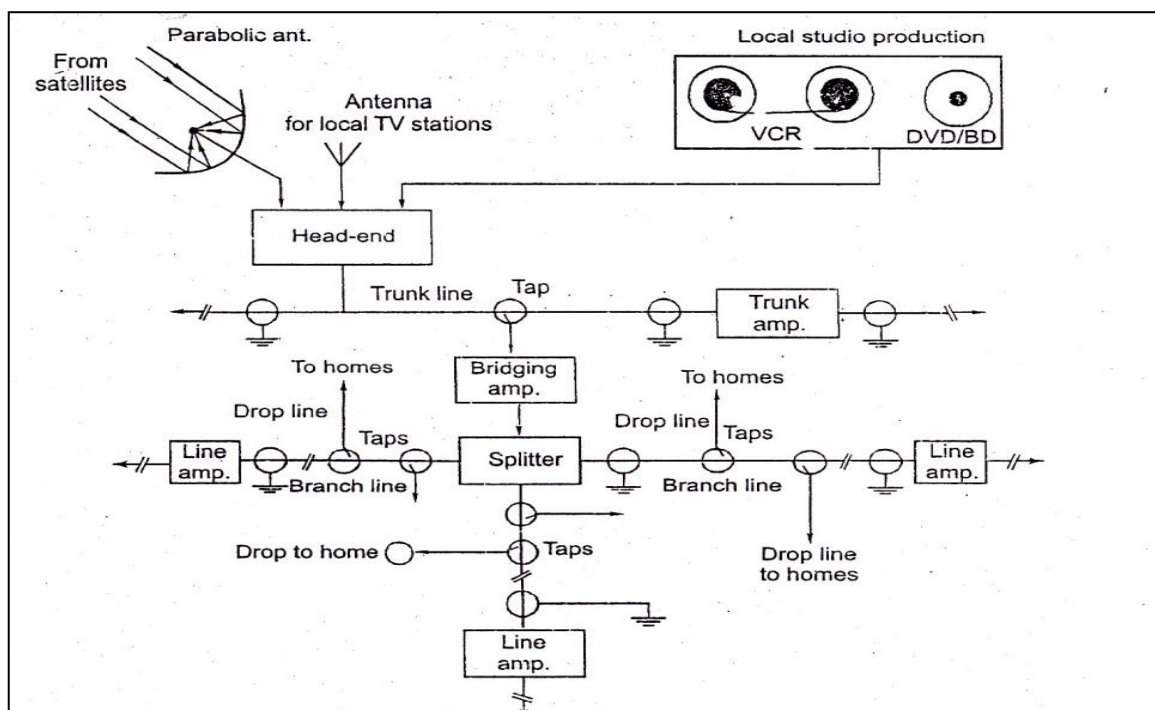
1. The slimmest of all displays
2. Very high contrast ratios [1:2,000,000]
3. Weightless and is less bulky than CRT's.
4. Higher viewing angles compared to other displays [178 degrees].
5. Can be placed even on walls.
6. High clarity and hence better colour reproduction. [68 billion/236 vs 16.7 million/224]
7. Very little motion blur due to high refresh rates and response time.
8. Has a life span of about 100,000 hours

• **Demerits of Plasma Display: [Any two]**

1. Cost is much higher compared to other displays.
2. Energy consumption is more.
3. Produces glares due to reflection. These displays are not available in smaller sizes than 32 inches.
4. Though the display doesn't weigh much, when the glass screen, which is needed to protect the display, is included, weighs more.
5. Cannot be used in high altitudes. The pressure difference between the gas and the air may cause a temporary damage or a buzzing noise.
6. Area flickering is possible

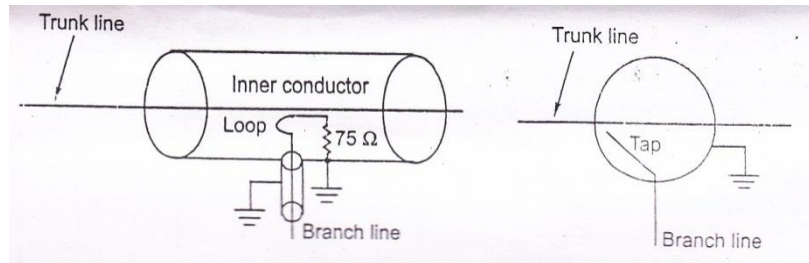
f) Draw the basic elements of CATV and state the function of directional coupler

Ans: (Diagram 3M, Function 1M)





As the several branches come out of the trunk line, it is necessary to ensure that each branch line extracts only a small energy from the trunk line. The device called directional coupler is used to ensure this. It is a three terminal device.



The loop works as a capacitance as well as inductance and is internally terminated in a 75 ohm resistor. The directional coupler ignores the reflected energy and has a very small insertion loss.