



MODEL ANSWER
SUMMER– 17 EXAMINATION

Subject Title:Audio Video Engineering

Subject Code: **17537**

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 anyequivalent 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
Q.1	(A)	Attempt any three :	12M
	a)	Draw the block diagram of dB meter with neat label.	4M
	Ans:	<pre> graph LR Input(()) --- Pre-amplifier[Pre-amplifier] Pre-amplifier --- Weighting[Weighting network or filters] Weighting --- Amplifier[Amplifier] Amplifier --- Rectifier[Rectifier] Rectifier --- Averaging[Averaging system] Averaging --- Display[Display] ACoutlet((AC outlet)) --- Amplifier </pre>	4M
	b)	Define the following terms :	4M
		i) Contrast ii) Luminance iii) Hue iv) Saturation.	
	Ans:	1. Contrast: This is the difference in light intensity between black and white parts of the picture over the average brightness level. 2. Luminance: Luminance is the amount of light intensity or the total amount of light energy that is received by the eye irrespective of the colour of light. In monochrome TV, better lighted	(1M each)



parts have more luminance than dark areas and different colours have shades of luminance.

3. Hue:

This is the predominant spectral colour of received light which means it is the actual colour seen by the eye. Red, Green, Blue, Yellow, Magenta, represent different in the visible spectrum.

4. Saturation :

- It represents the spectral purity of a colour light. It is the amount of white light that is mixed with a colour.
- A fully saturated colour will have no white light mixed with it.
- For example, a Pure Red without White is a saturated colour.

c) Compare stereo amplifier and mono amplifier. (any four points).

4M

Ans:

SR.No	Stereo amplifier	Mono amplifier
1	Stereo means solid and phone is sound in Greek, means three dimensional sound.	Mono means one sound or one dimensional sound.
2	Sound arises from the two different amplifiers so that sound appears to be surrounded.	Monophonic sound system has one source
3	It has two different channels (left and right) corresponds to two amplifiers and loud speakers.	Mono amplifier has one channel and one speaker system.
4	Stereo amplifier can have multispeaker system which gives surround system.	Multiloud speakers can be connected but with same source.
5	With stereo system sound reproduced is actual feels original	The monophonic sound is cheap to be produced but lacks naturalness.
6	Used in Hi-Fi amplifier system.	Used in public address system.

(Any 4 points)

(1M each)

d) List the different components used in CD player. State their functions.

4M



i) Different types of motors used in CD players are:

- Tray loading or carriage motor,
- Slide sled feed motor and
- Spindle, disc, turn table motor.

a) The tray or loading motor moves the CD tray in and out for loading and unloading the CD when the open/close switch is pressed.

b) A disc, spindle or turntable motor rotates the CD 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 CD.

c) The slide, feed or sled motor moves the optical pickup unit from the center to the outer edge of the disc on sliding rods. Some players have a pick-up motor that travels in a radial or semicircle fashion.

ii) The pick-up assemble consist of –

A low power laser diode to illuminate the CD tracks.

Lens and prism arrangement to direct the laser beam to the CD surface and to direct the reflected laser beam towards photodiode array.

A photodiode array to obtain data, focus and tracking signal from the reflected laser beam.

Focus and tracking coils to focus the beam to the CD surface and to move the assembly to proper track across the disc surface.

Some optical units do not contain the tracking coil, for example, the single-beam radial tracking assembly, this is explained in latter sections.

ii) Type of CD Lenses used in CD player:-

- Collimation lens
- Concave lens
- Objective lens
- Cylindrical lens

1. Collimation lens:

The collimator lens is used to produce completely parallel beams of laser. This lens together with the objective lens is used to focus the laser beam to the disc surface.

2. Concave lens:

In single-beam linear optical block assembly this concave lens is used to concentrate the laser beam, reflected from the disc surface, onto the photo diode array. This lens is mainly used to improve the sensitivity of the photo diode array.

3. Objective lens:

Before hitting the disc surface, the laser beam comes out the pick-up assembly through an objective lens. The objective lens is used to focus, laser beam onto the CD surface and to receive the reflected laser beam.

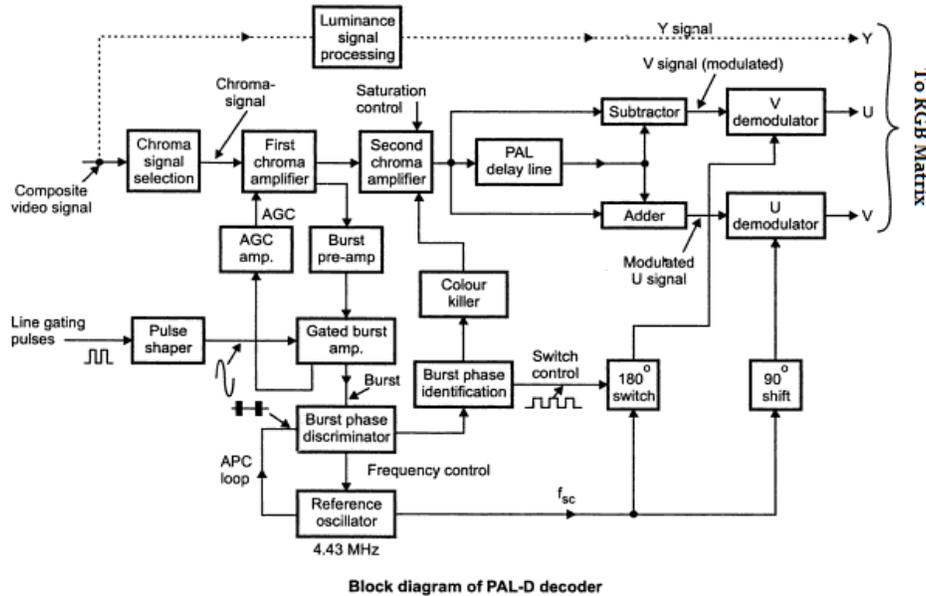
4. Cylindrical lens (in Three-Beam Linear Optical Blocks):-

The main action of this lens is to enable the reflected beam from the CD to assist in creating the necessary signal to make sure that focus of the laser beam on the playing surface the disc is maintained.

B) Attempt any one: 6M

a) Draw the block diagram of PAL-D decoder and write function of each block. 6M

Ans: Block diagram and operation of PAL-D decoder: 3M



Chroma signal selection:

Its function is to select Chroma and colour burst signal from the incoming CCVS signal. It essentially consist of band pass circuit whose center frequency is chosen to be equal to that of Chroma sub-carrier itself i.e.4.43MHz.

- **1st Chroma amplifier:**

The Chroma and burst signals are amplified by first Chroma amplifier which is controlled by DC voltage developed by the Automatic Chroma Control (ACC) amplifier.

- **2nd Chroma amplifier:**

The second Chroma amplifier incorporates colour saturation control circuit. The output of colour killer also feeds into it.

- **PAL delay line (separation of U and V colourphasors):**

This network separated U and V signals with are then fed to respective demodulator.

- **Gated burst amplifier:**

The gated burst amplifier separates the burst pulses and amplifies them a level suitable to operate the burst phase discriminator.

- **Automatic Chroma Control (ACC):**

The magnitude of the voltage so fed back is proportional to the magnitude of the burst and therefore to the amplitude of Chroma signal itself. This voltage is used to control the first stage of Chroma amplifier in such way to ensure constant Chroma signal amplitude.

- **Burst phase discriminator:**

It is sensitive to burst pulses and is designed to detect any differences which might exist between the phase of burst pulse and that of the reference oscillator. It produces at its output

3M

		<p>a dc voltage whose magnitude and polarity are proportional to the magnitude and direction of the detected phase difference.</p> <ul style="list-style-type: none"> • <u>Burst phase identifier:</u> This circuit is able to identify the phase relationship of the colour burst. • <u>180° switch:</u> This switch is used to periodically invert the waveform fed to the v-signal demodulator. • <u>Colour killer control:</u> This is just a half wave rectifier which produces a steady dc potential from the succession of burst pulses. During black and white transmission the dc potential is absent and hence biases the 2nd Chroma amplifier to cut off state. 	
	b)	Explain working of camera tube state different types of camera tube.	6M
	Ans:	<p><u>Basic principle:-</u> When minute details of a picture are taken into account, any picture appears to be composed of small elementary areas of light or shade, which are known as picture elements. The elements thus contain the visual image of the scene. The purpose of a TV pick-up tube is to sense each element independently and develop a signal in electrical form proportional to the brightness of each element. Light from the scene is focused on a photosensitive surface known as the image plate, and the optical image thus formed with a lens system represents light intensity variations of the scene. The photoelectric properties of the image plate then convert different light intensities into corresponding electrical variations.</p> <p><u>Types of camera tubes:</u></p> <ul style="list-style-type: none"> • Image Orthicon • Vidicon • The Plumbicon • Silicon Diode Array Vidicon • Solid State Image Scanners 	4M
Q 2		Attempt any four :	16M
	a)	Draw the constructional diagram of Yagi Uda Antenna and state the function of each component.	4M
	Ans:	<p>This antenna is widely used with television receiver for a location within 40 to 60km from the transmitter has folded dipole with one reflector one director. The elements of its array are as shown in fig.(a) and is relatively unidirectional as seen from its radiation pattern drawn in fig.(b)</p> <p><u>Diagram:-</u></p>	2M
<u>OR</u>			

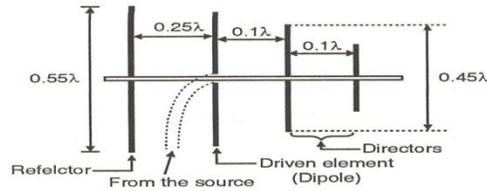
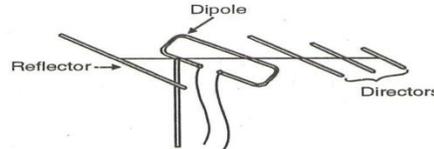
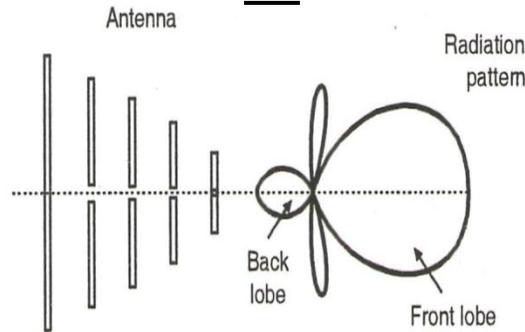


Fig. Yagi-Uda antenna



OR



Radiation pattern of Yagi-Uda antenna

Function of reflector: The reflector rod is longer in length by about 10% of the length of dipole. The dipole is 0.5λ and reflector is 0.55λ . Reflector acts as a tuned circuit whose resonant frequency is lower than the frequency of the signal being received by the active dipole element.

Function of director: Director concentrates the energy in the same direction in which the radio wave is moving. The director rod is shorter than the dipole by about 10% of the length of dipole. It collects the maximum signal strengths. So the number of directors is more than one. Director face towards transmitting antenna.

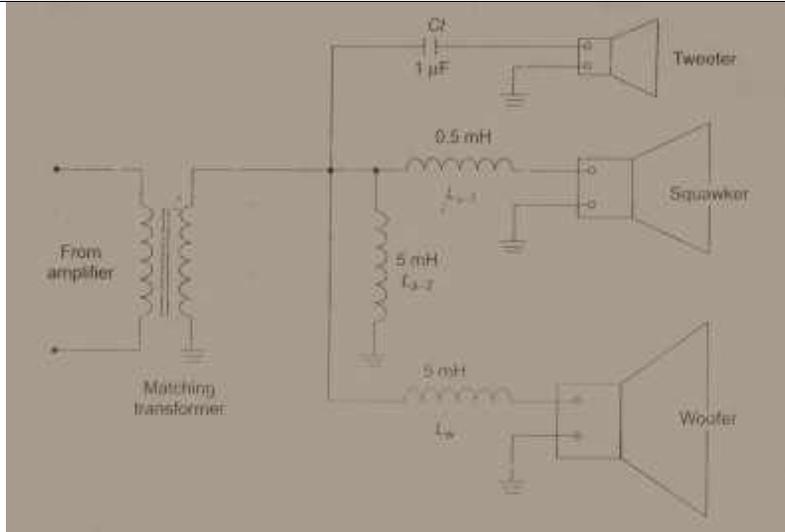
Function Dipole: Collects all signal strength from directors and fed to TV receiver through Parallel wire.

2M

b) Draw the three way cross over network also draw its frequency response.

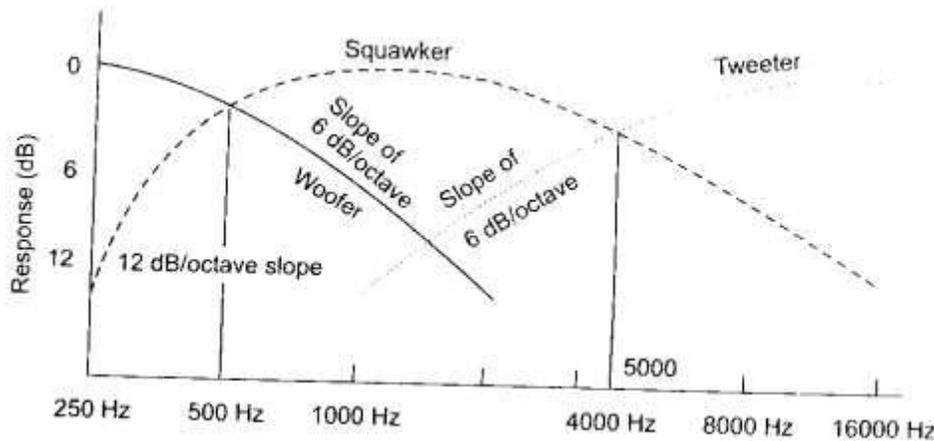
4M

Ans:



2M

Frequency Response:-

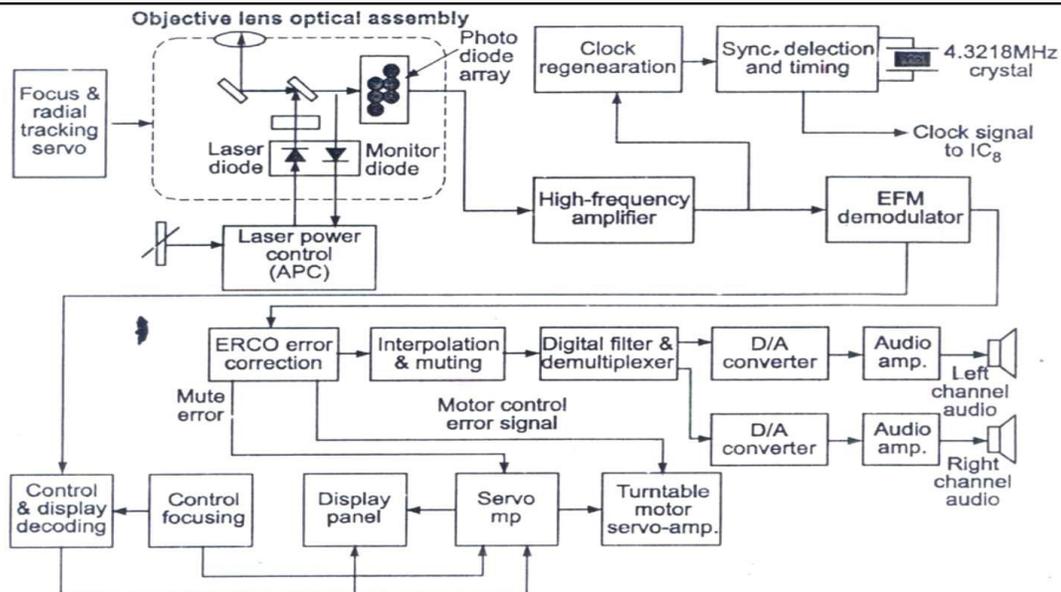


2M

c) Draw the block diagram of CD player and explain its working.

4M

Ans:



2M

CLV: The CD player is also known as CLV or constant linear velocity system. In a CLV



device such as the CD player the rotational speed of disc player is adjusted with movement of reading mechanism on the disc surface. This speed is changed to maintain constant linear velocity i.e. the signal on the disc surface always moves at constant speed of 1.3 m per second under the pick-up head.

Half-Full Memory: This half –full memory circuit makes the disc to maintain a constant linear velocity when the reading mechanism moves from outer tracks of disc to inner tracks or from inner tracks to outer tracks on disc surface.

Decoding CD: During the decoding, the digital data on the disc surface is read by the decoding circuit and is converted into the analog and 0 signal required to drive the speakers and regenerate the stored music.

Optical pick-up: The signal stored on the CD surface as pits and flat areas are first picked up by the optical pickup made of lens assembly prism, photo detectors and laser diodes assembly in the optical pick-up unit.

High frequency amplifier: The signal is very weak so it is amplified by a high frequency RF amplifier circuit to bring signal to a proper level. This amplified and filtered high-frequency signal contains audio signal as well as synchronization signal in 14-bit EFM (eight to fourteen modulated) format, this signal is sent to an EFM demodulator circuit.

EFM Demodulator: The EFM demodulator separates the modulated data and the timing signal from the signal received at its input. It also removes the additional coupling bits and convert the 14-bit EFM symbol to actual 8-bit data. The amplified and filtered EFM signal from high frequency amplifier is also given to clock generation circuit to synchronize detecting and timing circuit. These circuits are used to recover the bit clock and sync pattern data .The timing separated by this system is used to provide timing signal to the system.

ERCO Circuit: demodulated data from EFM demodulator is send to error correction (ERCO) circuit. The demodulated data signals also send to control and display decoding circuit, which recovers the control and display signal received from CD.

Interpolation and muting: The ERCO circuit is used for error detection and correction purpose. Any error found in the incoming data signal is send to interpolation and muting section by the

ERCO circuit. The interpolation and muting section uses the following methods to correct error found in data stream read from the disc.

- Muting
- Last word held
- Linear Interpolation

Muting: In muting, when error is detected in the data stream , the player will mute (silence)the sound is not to send speaker .

CLV using the Clock Signal: The ERCO also responsible for maintaining constant linear velocity of CD rotation motor , For this , The TRCO circuit compare the clock signal derived from the incoming data with reference clock frequency.

De- interleaving: Signals from the ERCO contains audio signal in the interleaved format. before doing any further operation on this signal, it must be interleaved. The signal Is then de-interleaved in the interpolation and muting section to restore the original sequence of information.

Digital Filter and De-multiplexer: The de-interleaved and regenerated is then send to digital filter and de-multiplexer , where it is filtered and separated in to left and right channel data. This circuit removes any effect of sampling frequency from the data signal ,

2M

which would appear as interference in the form of aliasing noise in analog signal.
Oversampling: During digital filtering oversampling method is used to remove both problems of aliasing noise and quantization error.
D/A convertor: The output from digital filter and de-multiplexer circuit is sent to D/A convertors. The right and left channels are processed by different D/A convertors. These convertors convert the 16-bit digital signal into the original analog audio signal. Because of the over sampling, done in the digital filter and de-multiplexer circuit simple low-pass filter is used following the D/A process.

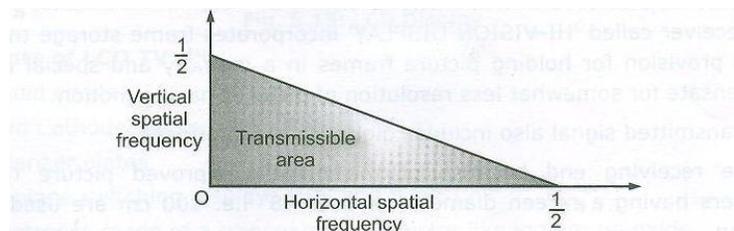
d) Describe NHK and MUSE system.

4M

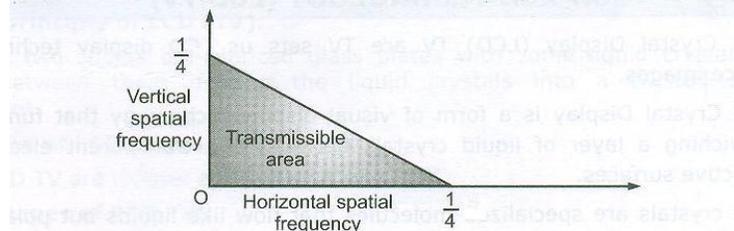
Ans: Description:

4M

- MUSE stands for Multiple Sub-Nyquist Sampling Encoding and is an HDTV bandwidth compression scheme developed by NHK.
- It uses fundamental concepts for performance exchange in the spatio – temporal (transitory transformation) domain along with motion compensation to reduce the transmission bandwidth down to near about 10 MHz.
- The processed HDTV signal can be then transmitted using a single BDS channel.
- Temporal Interpolation In MUSE the luminance and colour information are sent by time multiplexed components (TMC) The colour information is sent sequentially with a time compression of four.
- The TMC signal is bandwidth reduced means of 3 – dimensional offset subsampling pattern over a four – field sequence. The stationary areas of the picture are reconstructed by temporal interpolation of samples from four fields.
- For a moving picture area the final picture is reconstructed by spatial interpolation using samples from a single field. Hence moving portions of the picture are reproduced with one- quarter the spatial resolution of the stationary areas. The spatial frequency response for both stationary and moving areas of the picture is shown in figure below.
- Audio transmission is done by 4 – phase DPSK which is multiplexed with the processed video signal in the vertical blanking interval after frequency modulation of the transmission carrier by the video signal.



(a) For Stationary Portion of the Picture (Temporal Interpolation)

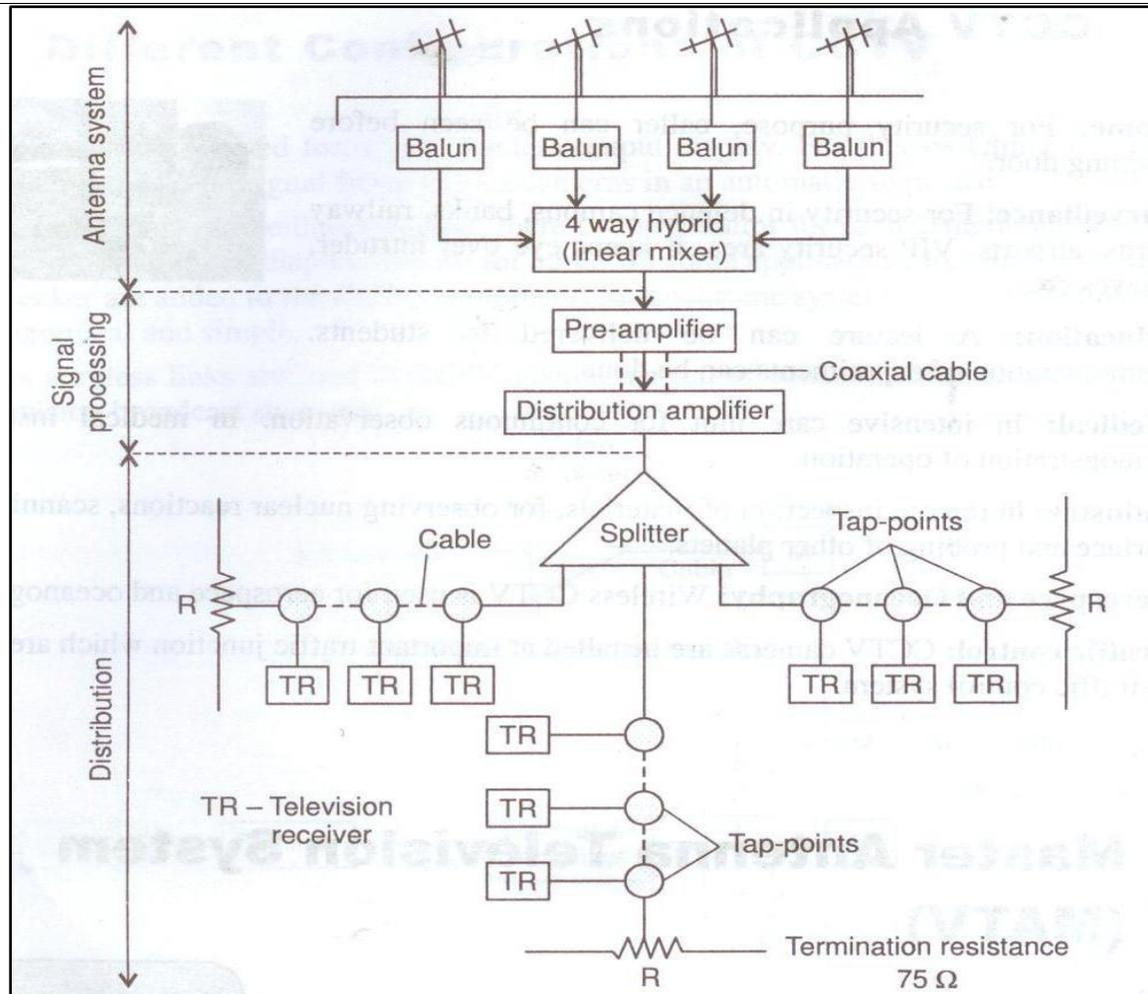


(b) For Moving Portion of the Picture (Spatial Interpolation)



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Ans:		Ch No.	Frequency range	Picture carrier	Sound carrier	4M
				Frequency (MHz)	Frequency (MHz)	
	BAND I (41-68 MHz)	1	41-47 (not used)			
		2	47-54	48.25	53.75	
		3	54-61	55.25	60.75	
		4	61-68	62.25	67.75	
	BAND III (174-230 MHz)	5	174-181	175.25	180.75	
		6	181-188	182.25	187.75	
		7	188-195	189.25	194.75	
		8	195-202	196.25	201.75	
		9	202-209	203.25	208.75	
		10	209-216	210.25	215.75	
		11	216-223	217.25	222.75	
		12	223-230	224.25	229.75	
Q. 3	Attempt any four:					16M
a)	Draw the layout diagram for distribution of cable connection for MATV and describe it.					4M
Ans:	<u>Diagram:</u>					2M



Master antenna TV system is used to deliver a strong signal (over 1mv). It is delivered from one or more antennas to every television receiver connected to the system. This type of system is implemented in the areas where signal strength is less. It is generally used in large hotels, motels schools and apartment building.

2M

Master or common antenna: One or more antennas are usually located one roof top. The number of antennas is dependent on available telecast and their direction. Each antenna is directive and properly oriented.

Balun: MATV system is having impedance of 75Ω . Most of the antennas are having impedance of 300Ω . Balun is used to match balance antenna with an unbalanced coaxial cable. It is a matching transformer.

Hybrid: Antenna outputs feed in to a 4 way hybrid. A hybrid is a signal combining signal linear mixer. It provides suitable impedance matches to prevent standing waves produced. The standing waves results in ghost images.

Amplifiers: There are two types of amplifiers. One is preamplifier which is low noise amplifier to keep SNR high at the antenna. The other is a high gain amplifier called as distribution amplifier. It is used to boost the signal to compensate the loss which would occur in the distribution cables. It provides acceptable signal to every receiver in the system.

Coupler or splitter: Coupler or splitter is a coupling device which splits the signal to feed to the main branch lines. The output from distribution amplifier is fed to splitters trough coaxial trunk lines. A splitter is a resistive- inductive device. It provides trunk line isolation

and impedance matching.

Subscriber taps: Each branch line serves several homes. Coaxial distribution branch lines carry television signal. The output of splitter is delivered to subscriber through tap-offs. The subscriber taps can be transformer coupled capacitive coupled or resistive pads. The tap provides isolation from other receiver on the same trance. This prevents mutual interference. The taps look like ac outlets. They are mounted normally in the wall. Wall taps may be obtained with 300 Ω output or 75 Ω tap with a matching transformer is preferred. The matching transformer is mounted at the antenna terminal of the receiver. It will have a VHF output and UHF output.

TV receivers: The modulated ratio frequency carrier is fed to each individual TV receiver. It is fed from respective tapping on the branch line. The feeder is off twin feeder type or coaxial cable. Its impedance is matched with impedance of TV receiver.

Terminal resistance: he improperly terminated lines develops standing waves, each branch line should be properly terminated. For this, the end of each 75 Ω distribution cable is terminated with 75 Ω resistor is called terminator.

b) Draw the diagram of graphic equalizer and explain it.

Ans: Diagram:

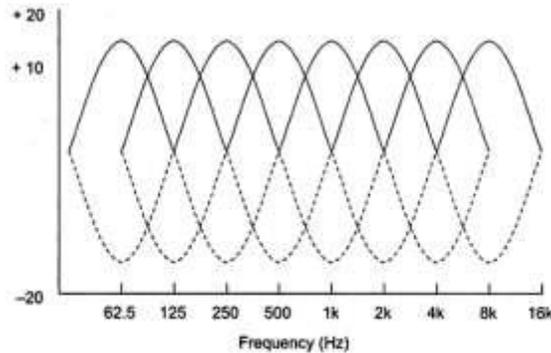


Fig. Boost/cut for bands at frequencies centered one octave wide

OR

4M
(Diagram
-
2M,Expla
nation-
2M)

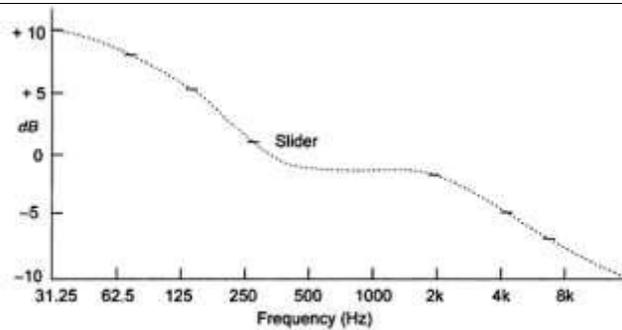


Fig. Position of sliders of graphic equaliser to get a specified response curve (dotted line)

Graphic Equalizer:

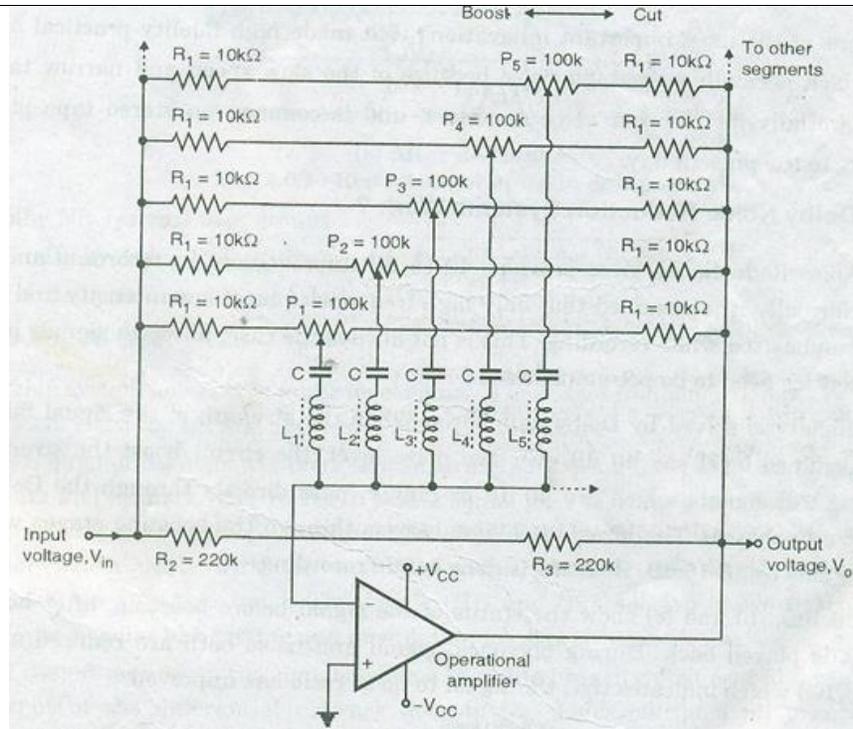
Explanation:

A graphic equalizer is a high-fidelity audio control that allows the user to see graphically and control individually a number of different frequency bands in a stereophonic system. A typical graphic equalizer consists of several audio filter/amplifiers, each centered at a specific frequency in the audio range.

- Most graphic equalizers have two identical sets of filter/amplifiers, one for each channel in a stereophonic system.
- The gain (volume) controls in most graphic equalizers are slide potentiometers that are adjusted by moving a control button up or down. Gain is increased by sliding the button upwards.
- The slide potentiometers for each channel are placed side-by-side, with the lowest-frequency unit at the left and the highest-frequency unit at the right. In this way, the positions of the buttons appear to follow a graphical curve that represents the gain as a function of frequency for each channel.

OR

Diagram:



Explanation:

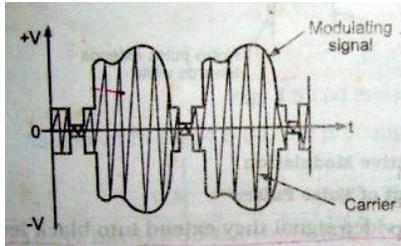
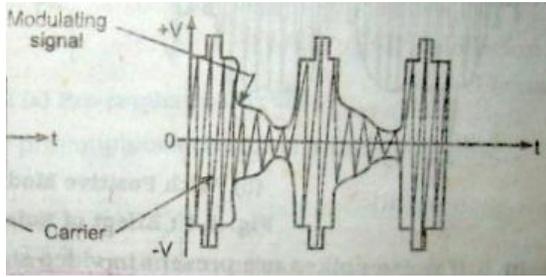
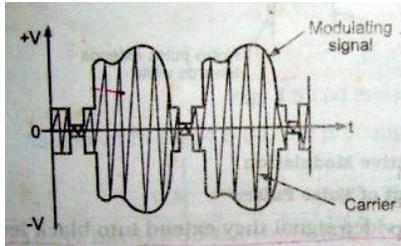
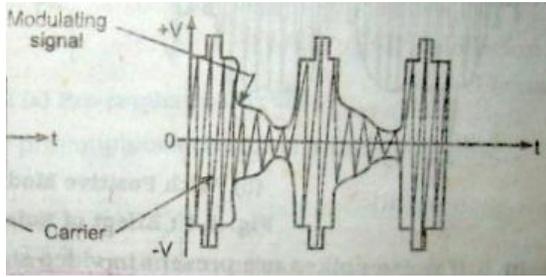
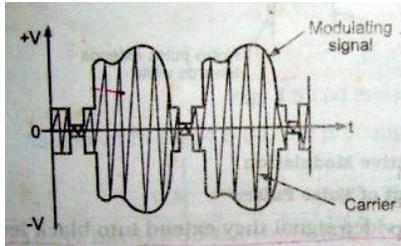
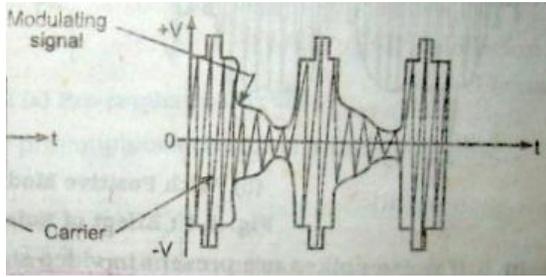
Graphic equalizer is used to eliminate unwanted peaks in the frequency response of audio systems. In five point configuration, the graphic equalizer breaks up an audio input signal into five different bands covering the range of human hearing. Once this is completed, the signal in each band can be adjusted to provide best sound. The center frequencies f_1, f_2, f_3, f_4 and f_5 of the frequency bands of the graphic equalizer are usually fixed at pre-set values. Once these bands are added back together, they are passed through an amplifier which increases the amplitude of the signal to the point where there is enough power that can be heard through an ordinary speaker. The graphic equalizer consists of an amplifier for every segment of octave band. Such amplifiers are connected in parallel to cover the complete frequency range. The individual gains of these amplifiers are adjusted such that the required frequency response is obtained. Using five amplifiers for five octaves of frequency may be very expensive.

c) State the requirement of stereo amplifier to be a HiFi amplifier (any four).

- Ans:**
1. Signal to noise ratio should be better than 50dB,
 2. Frequency response should be flat within ± 1 dB over the frequency range of 30Hz to 15,000Hz
 3. Non-linear distortion should not be more than 1%.
 4. The system should possess dynamic range at least 80dB, i.e. from whisper to booming music.
 5. Stereophonic effect should be provided.
 6. Environmental conditions should be such as to eliminate the external noise in listening room
 7. Dolby NR must be provided.
 8. The whole audio chain from microphones, pre amplifiers, power amplifiers, pick ups, recording amplifiers, loudspeakers much provide excellent quality.

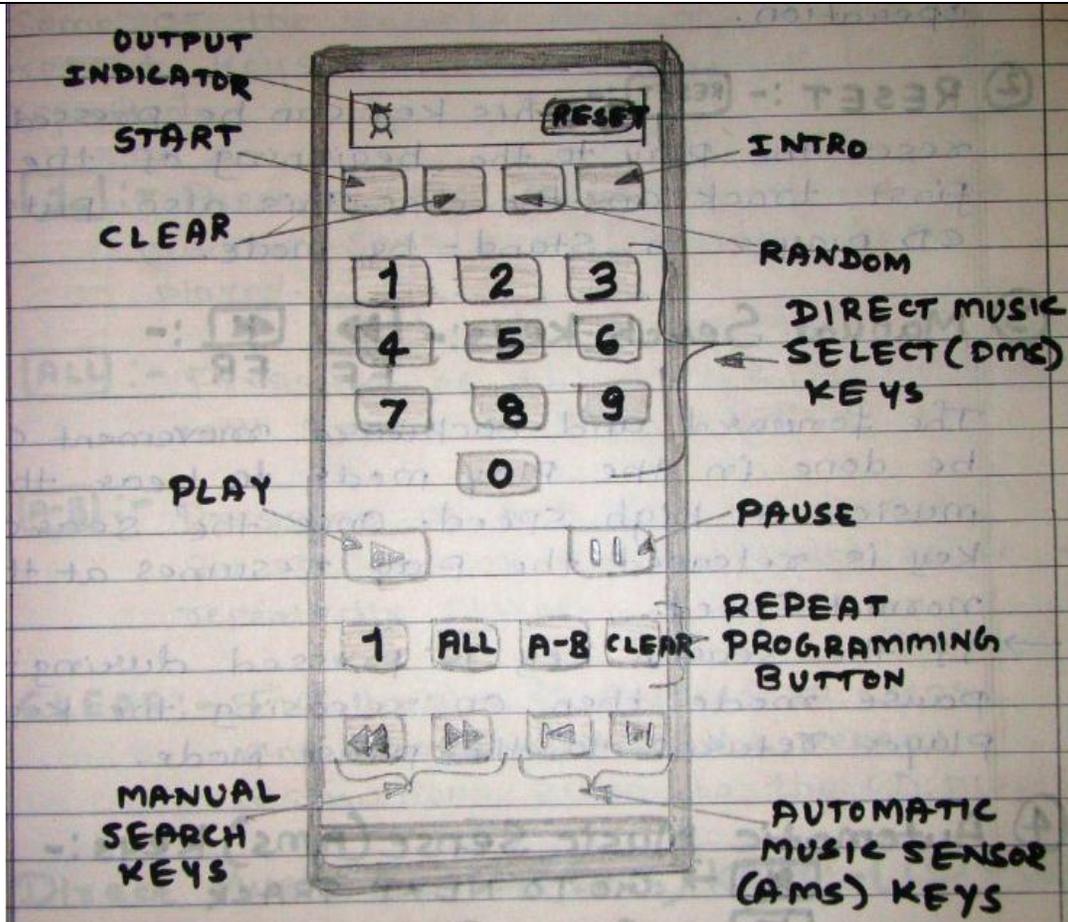
4M

(Any four requirements – 1M each)

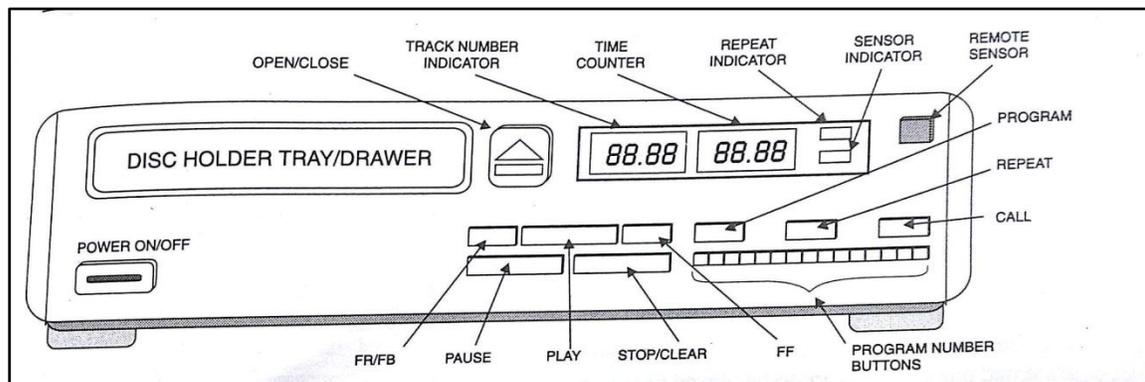
d)	State the advantages of fluorescent display system.	4M																					
Ans:	<ol style="list-style-type: none"> 1. Signal to noise ratio should be better than 50dB, 2. Frequency response should be flat within ± 1 dB over the frequency range of 30Hz to 15,000Hz 3. Non-linear distortion should not be more than 1%. 4. The system should possess dynamic range at least 80dB i.e from whisper to booming music. 5. Stereophonic effect should be provided. 6. Environmental conditions should be such as to eliminate the external noise in listening room 7. Dolby NR must be provided. 8. The whole audio chain from microphones, pre amplifiers, power amplifiers, pick ups, recording amplifiers, loudspeakers much provide excellent quality. 	(Any four requireme nts – 1M each)																					
e)	Distinguish between positive and negative modulation.	4M																					
Ans:	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%; text-align: center;">Sr No</th> <th style="width: 45%; text-align: center;">Positive modulation</th> <th style="width: 45%; text-align: center;">Negative modulation</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td>When increase in brightness of that picture results in an increase of the amplitude of modulated envelope.it is called positive modulation.</td> <td>When increase in brightness reduces amplitude of the modulated envelope, it is called negative modulation.</td> </tr> <tr> <td style="text-align: center;">2</td> <td>White level of video signal corresponds to 100% total magnitude.</td> <td>White level of video signal correspondence to 12.5% of the total amplitude.</td> </tr> <tr> <td style="text-align: center;">3</td> <td> Waveform  </td> <td> Waveform  </td> </tr> <tr> <td style="text-align: center;">4</td> <td>Noise pulses do not effect synchronization but cause white spot in the picture</td> <td>Noise pulses are seen as less annoying black spot.</td> </tr> <tr> <td style="text-align: center;">5</td> <td>More power is required with less efficiency</td> <td>If peak power available from transmitter is considered them less power is required for more efficiency.</td> </tr> <tr> <td style="text-align: center;">6</td> <td>Black level of video signal</td> <td>Blanking level starts at 75%</td> </tr> </tbody> </table>	Sr No	Positive modulation	Negative modulation	1	When increase in brightness of that picture results in an increase of the amplitude of modulated envelope.it is called positive modulation.	When increase in brightness reduces amplitude of the modulated envelope, it is called negative modulation.	2	White level of video signal corresponds to 100% total magnitude.	White level of video signal correspondence to 12.5% of the total amplitude.	3	Waveform 	Waveform 	4	Noise pulses do not effect synchronization but cause white spot in the picture	Noise pulses are seen as less annoying black spot.	5	More power is required with less efficiency	If peak power available from transmitter is considered them less power is required for more efficiency.	6	Black level of video signal	Blanking level starts at 75%	Comparis on (Any 4 points: 1M each)
Sr No	Positive modulation	Negative modulation																					
1	When increase in brightness of that picture results in an increase of the amplitude of modulated envelope.it is called positive modulation.	When increase in brightness reduces amplitude of the modulated envelope, it is called negative modulation.																					
2	White level of video signal corresponds to 100% total magnitude.	White level of video signal correspondence to 12.5% of the total amplitude.																					
3	Waveform 	Waveform 																					
4	Noise pulses do not effect synchronization but cause white spot in the picture	Noise pulses are seen as less annoying black spot.																					
5	More power is required with less efficiency	If peak power available from transmitter is considered them less power is required for more efficiency.																					
6	Black level of video signal	Blanking level starts at 75%																					



		correspondence to 25% of total magnitude.	
	f)	Define vestigial side band transmission. State its any twomerits and demerits.	4M
	Ans:	<p>The picture signal is amplitude modulated and sound signal is frequency modulated before transmission. In 625 line system, the video signal frequency components are from 0 Hz to 5MHz. In Double side band A.M. transmission is used, bandwidth required will be 10MHz. Actual bandwidth is more than this due to practical filter characteristics. Practically it is not possible to determine the bandwidth abruptly so guard band of 0.5 MHz on each side should be given. In addition to this, 0.25 MHz is given for sound transmission on upper side. This together with forms channel bandwidth as 11.25 MHz using doubled side band system.</p> <p>To reduce bandwidth and power transmitted vestigial side band system is used. In this full upper side band transmitted and vestige or part of lower side band transmitted which results in to reduced bandwidth to 7 MHz.</p> <p><u>Merits: (Any two)</u></p> <ul style="list-style-type: none"> • Bandwidth is reduced so that more number of channels can be accommodated in a given frequency spectrum. • Power saving of 50% possible at transmitted power is moderate. • Filter design becomes practicable so circuits used are not costly complex. • No distortion occurs and no loss of low frequency component results in less interference. <p><u>Demerits: (Any two)</u></p> <ul style="list-style-type: none"> • A small portion of transmitter power is wasted in the vestigial side band filters which remove the lower sideband. • Signal to noise ratio is slightly less than what it would be in total D.S.B. because in the vestigial sideband signal, the lower side band frequencies from of 0 to 0.75 are present in both sidebands while the rest of the frequencies from 0.75 to 5MHZ are present only in one sideband. • The low video frequencies contain the most important information of picture is if the lower sideband is completely suppressed then there is distortion which is manifested as “smear” in the picture. 	(Define: 2M, Merit: 1M, Demerit: 1M)
Q. 4	A)	Attempt any three :	12M
	i)	Draw the block diagram of transmitter and receiver section of remote control for CD player.	4M
	Ans:	<p><u>Note: Any other Relevent diagram can be considered</u></p> <p><u>Transmitter section of remote control for CD player-</u></p>	(Transmitter Section: 2M, Receiver Section: 2M)



Receiver section of remote control for CD player-



OR

Transmitter section



Receiver Section



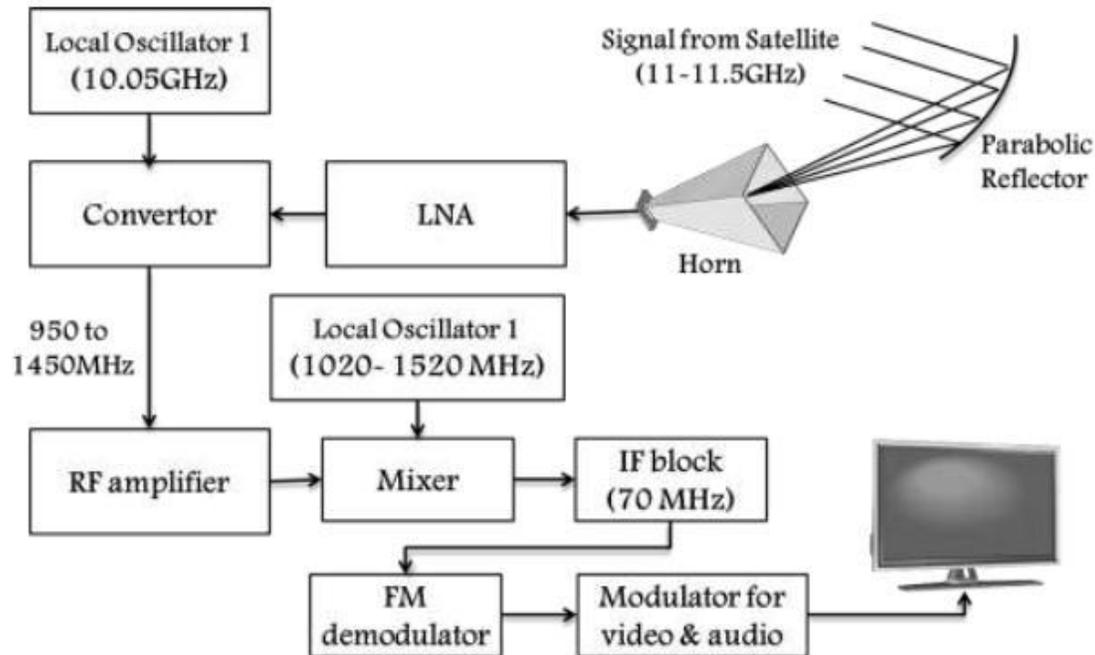
Block Diagram of Infrared Remote Control Switch

ii) **Draw and explain the block diagram of DTH system.**

4M

Ans: Diagram:

2M



Explanation:-

Direct to home technology refers to the satellite television broadcasting process which is actually intended for home reception. This technology is originally referred to as direct broadcast satellite (DBS) technology. In short, DTH refers to the reception of satellite signals on a TV with a personal dish in an individual home. The satellites that are used for this purpose is geostationary satellites. The satellite compresses the signal digitally, encrypts them and then is beamed from high powered geostationary satellites. They are received by the dishes that are given to the DTH consumers by DTH providers.

2M

1)Outdoor unit:

It consists of a receiving antenna, low noise amplifier & converter the receiving antenna is

parabolic reflector with a horn as the active element. The horn can be directly in front of reflector, or it may use an offset feed as shown in fig. The reflector diameter may be 0.6m for 11GHz & still smaller for K &Ka bands.

- The low noise block consists of a low noise wide band amplifier followed by a convertor. The output of convertor consists of a signal of UHF frequency ranging from 950-1450MHz.
- The advantage of using UHF frequency is that a low cost coaxial cable can be used as feeder from the outdoor unit to the indoor unit.
- LNB cannot be kept indoor because long cable between horn & the first amplifier will cause substantial degradation of the overall noise figure of the set.

2)Indoor unit:

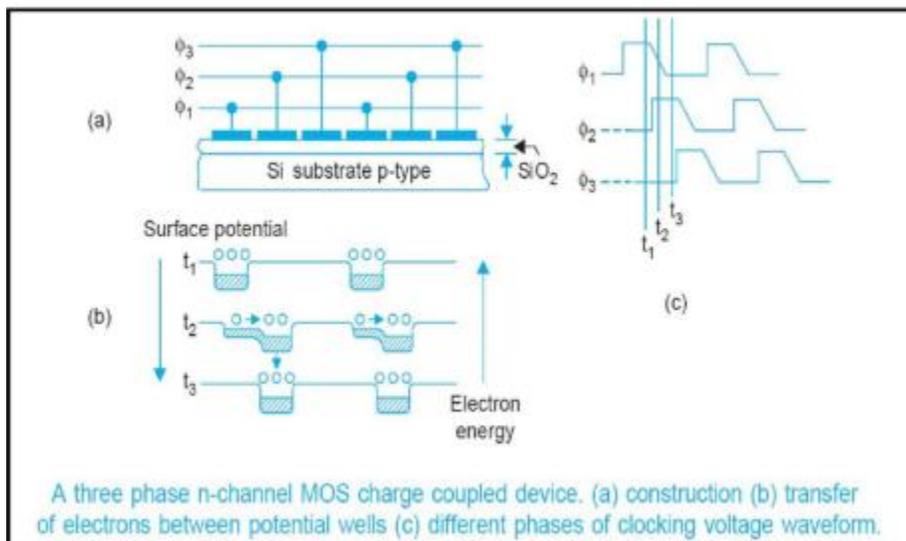
- The wideband signal from LNB is fed to an RF amplifier. The amplified signal is fed to the channel selector circuits which selects the wanted band.
- The selected channel is down converted to a fixed IF of 70 MHz by local oscillator and mixer. IF amplifier amplifies the signal which is then goes to FM detector.
- The detector recovers the original baseband signal, consisting of CVS & audio signal. These modulated signals are fed to the normal domestic TV receiver, which after due processing reproduces picture and sound.

iii) **With neat sketch describe the working of solid state camera based on CCD.**

4M

Ans: Diagram:

2M



Explanation:-

The operation of solid state image scanners is based on the functioning of charge coupled devices (CCDs) which is a new concept in metal-oxide-semiconductor (MOS) circuitry. The CCD may be thought of to be a shift register formed by a string of very closely spaced MOS capacitors. It can store and transfer analog charge signal either electrons or holes that may be introduced electrically or optically. The constructional details and the manner in which storing and transferring of charge occurs is illustrated in figure below. The chip consists of a p-type substrate, the one side of which is oxidized to form a film of silicon dioxide, which is an insulator. Then by photolithographic processes, similar to those used in miniature integrated circuits an array of metal electrodes, known as gates, is deposited on the insulator film. This results in the creation of a very large number of tiny MOS

2M

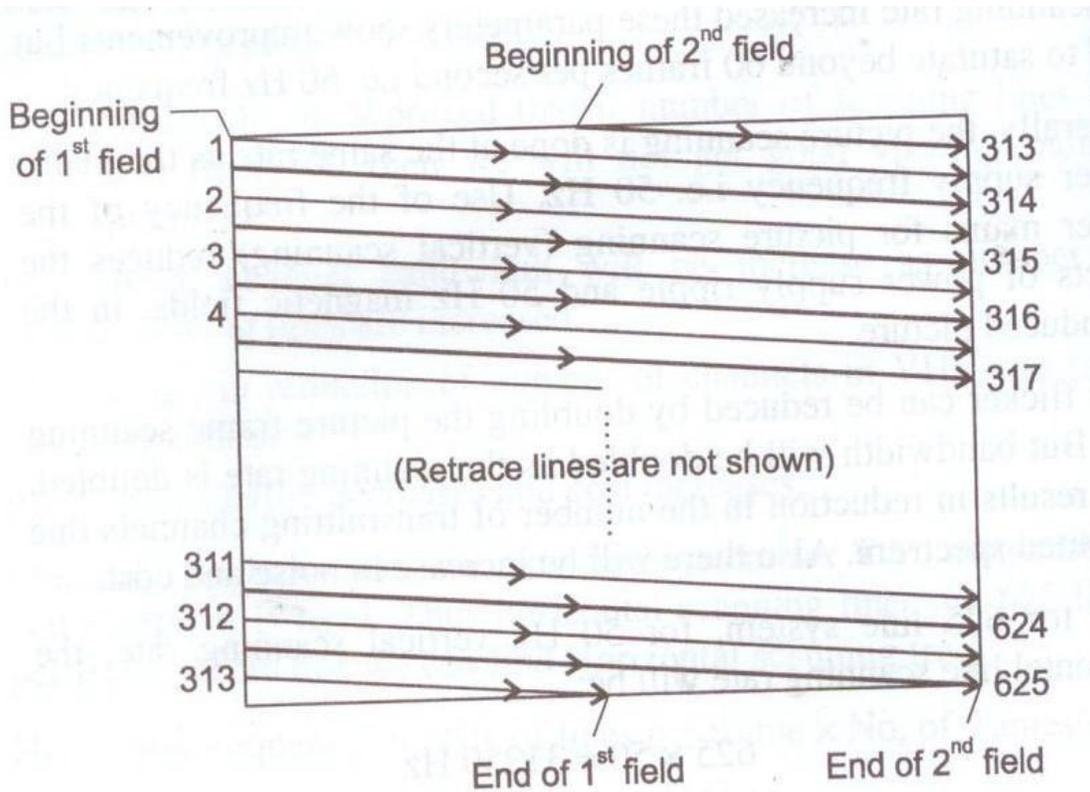
capacitors on the entire surface of the chip.

iv) **Describe with neat sketch how interlaced scanning will help to reduce the bandwidth of the video signal.**

4M

Ans: **Diagram:**

2M



Description:

To reduce flicker, an effective rate of 50 vertical scans per second is utilized in television pictures system. This is accomplished by increasing the downward rate of travel of the scanning electron beam. By increasing downward scanning rate, every alternate line gets scan instead for every successive line. After the 1st scan the beam reach the bottom of picture frame, the beam quickly returns to the top to scan remaining lines which are missed in 1st scan.

2M

Thus the total number of lines in picture frame are divided into are two groups called as fields. Each field is scan is scan alternately. This is called as interlaced scanning. This is like reading alternate lines of a page. It reduces flicker, which results in reduction of bandwidth and noise.

Figure shows principle of interlaced scanning. In this vertical retrace time is considered zero and horizontal retrace lines are not shown for convenience. This figure shows 625 lines T.V. system a frame of 625 lines is divided into two fields having 312.5 lines each. Each field is scanned alternately to cover the entire picture.

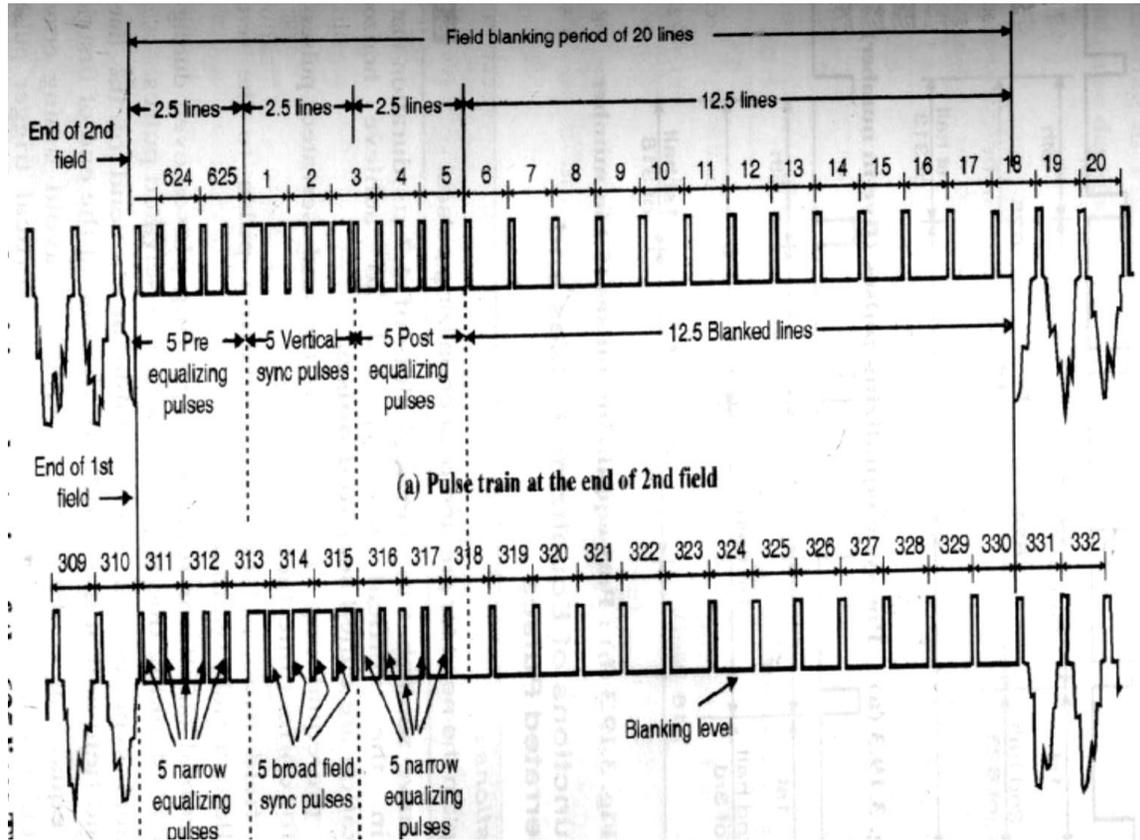
In first field, 312.5 odd lines are scanned only, which is called as odd field. The scanning sequence is 1, 3, 5, 7 ...

After this the beam spot returns to the top of the screen and remaining half part of the



	<p>313th lines and all even number of lines are scanned. This is called as even field. The scanning sequence is 2, 4, 6...</p> <p>To achieve this, the vertical sweep oscillator (saw tooth waveform) made to operate at 50Hz frequency so that to successive interlaced scans make up the complete picture frame.</p> <p>This method reduces flicker. But at high brightness levels interline flicker observed. Also bandwidth and noise reduced. Sometimes interlacing error occurs, if the lines of even fields are not exactly in the middle of the odd field. This will cause paring of lines which results in jagged picture giving silky effect or fishtail. Interlacing error results due to error in starting of first line of the even field. Even field does not starts exactly at the middle of the picture fame.</p> <p>Because of this uneven spacing between the lines of two fields occurs. It is caused due to an open capacitor in the integrating circuit or by an open decoupling capacitor in the vertical oscillator.</p> <p>The beam scans 625 lines per frame at the same rate of 15625 lines per second. Therefore ,with interlaced scanning, which in turn does not need any increase in channel bandwidth.</p>	
B)	Attempt any one:	6M
i)	Describe the need of equalizing pulses. Draw the structure of vertical synchronizing pulse.	6M
Ans:	<p><u>Note: Any other Relavant diagram can be considered</u></p> <p><u>Description:</u> This is a ½ line difference just prior to the start of serrated vertical pulse.</p> <ul style="list-style-type: none">• This ½ line difference does not affect the horizontal deflection synchronization but it does affect the vertical synchronization and the interlaced scanning. The effect of uneven line period can be reduced by increasing the interval between the preceding line pulse and the field sync pulses.• To ensure that the vertical deflection oscillator receives the necessary triggering voltage at the same time after every field, a series of five narrow pulses 2.3 μs each, occurring at half line rhythm, are inserted before the field sync pulse.• These are called pre equalizing pulses. The width of equalizing pulse is normally half the width of horizontal sync pulses, roughly half of 4.7 μs or (2.3 μs).• The equalizing pulses inserted after the vertical synchronizing pulses are post equalizing pulses. These equalizing pulses do not disturb the operation of either oscillator, yet they permit the vertical sync pulse to occur at the correct time after every field.	2M

Diagram :



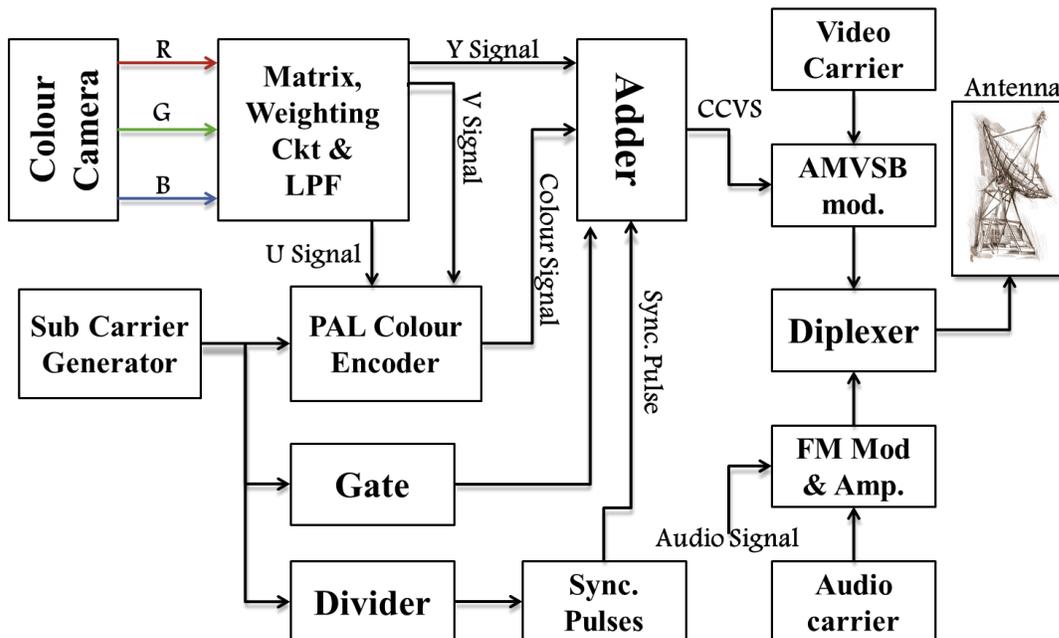
4M

ii) Draw the block diagram of colour TV transmitter.

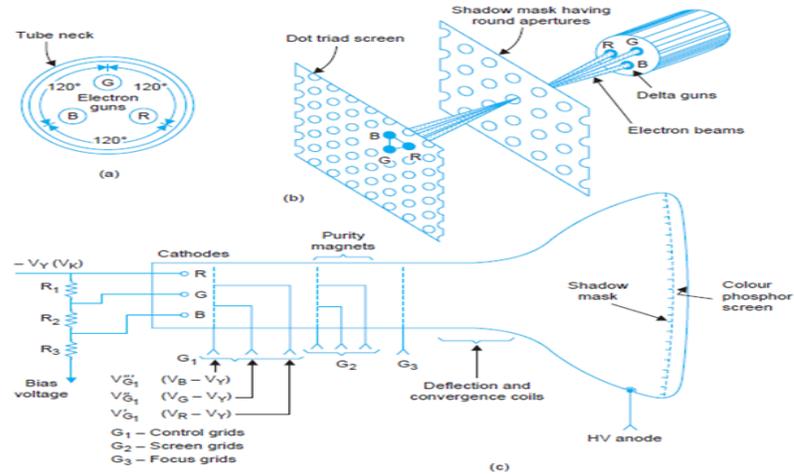
6M

Ans: Note: Any other Relevant diagram can be considered

6M



			4M
Q.5		Attempt any two :	16M
	a)	<p>Draw composite video signal of one line and state the function of following :</p> <ol style="list-style-type: none"> i) DC level ii) Blanking level iii) Whiter than white iv) Pedestal height. 	8M
	Ans:	<p>Diagram-</p> <p style="text-align: center;">Fig. 3.1 Arbitrary picture signal details of three scanning lines with different average brightness levels. Note that picture to sync ratio P/S = 10/4.</p> <p>Function-</p> <p>DC level: The video signal has an average value or dc component corresponding to the average brightness of the scene. In the absence of dc component the receiver cannot follow changes in brightness.</p> <p>Blanking level: The level above which the picture information is invisible on TV raster (Screen). The Blanking level starts at 72-75% of total amplitude of picture information.</p> <p>Whiter than white: The level below which the picture information appears as a white spot on TV raster (Screen). The Whiter than white level is at 0 to 12.5% of total amplitude of picture information.</p> <p>Pedestal height: Pedestal height is the distance between the pedestal level and average value (dc level) of the video signal. This indicates average brightness since it measures how much the average value differs from black level.</p>	4M
	b)	Draw the block diagram of delta gun colour picture tube and explain its working.	8M
	Ans:	<u>Note: Any other Relevant diagram can be considered</u>	4M



(a) guns viewed from the base
(b) electron beams, shadow mask and dot-triad phosphor screen
(c) showing application of 'Y' and colour difference signals

Explanation:-

- This tube was first developed by the Radio Corporation of America (R.C.A.). It employs three separate guns (see Fig. (a)), one for each phosphor. The guns are equally spaced at 120° interval with respect to each other and tilted inwards in relation to the axis of the tube. They form an equilateral triangular configuration.
- As shown in Fig.(b) the tube employs a screen where three colour phosphor dots are arranged in groups known as triads. Each phosphor dot corresponds to one of the three primary colours.
- The triads are repeated and depending on the size of the picture tube, approximately 1,000,000 such dots forming nearly 333,000 triads are deposited on the glass face plate. About one cm behind the tube screen (see Figs. (b) and (c)) is located a thin perforated metal sheet known as the shadow mask.
- The mask has one hole for every phosphor dot triad on the screen. The various holes are so oriented that electrons of the three beams on passing through any one hole will hit only the corresponding colour phosphor dots on the screen.
- The ratio of electrons passing through the holes to those reaching the shadow mask is only about 20 percent. The remaining 80 percent of the total beam current energy is dissipated as a heat loss in the shadow mask.
- While the electron transparency in other types of colour picture tubes is more, still, relatively large beam currents have to be maintained in all colour tubes compared to monochrome tubes.

Generation of Colour Raster:

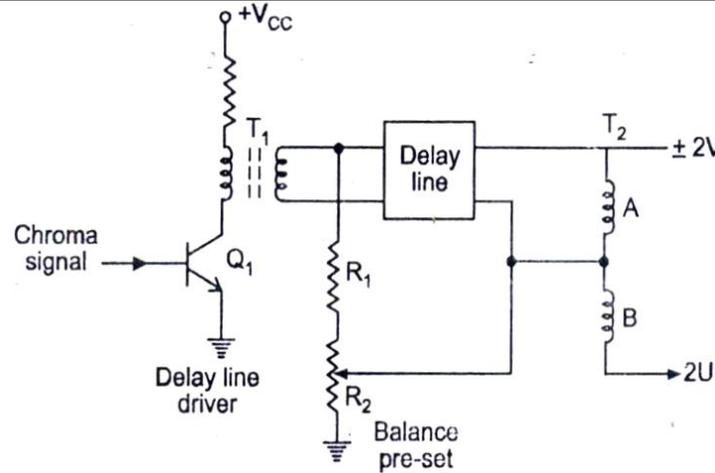
- The overall colour seen is determined both by the intensity of each beam and the phosphors which are being bombarded. If only one beam is 'on' and the remaining two are cut-off, dots of only one colour phosphor get excited. Thus the raster will be seen to have only one of the primary colours.

4M

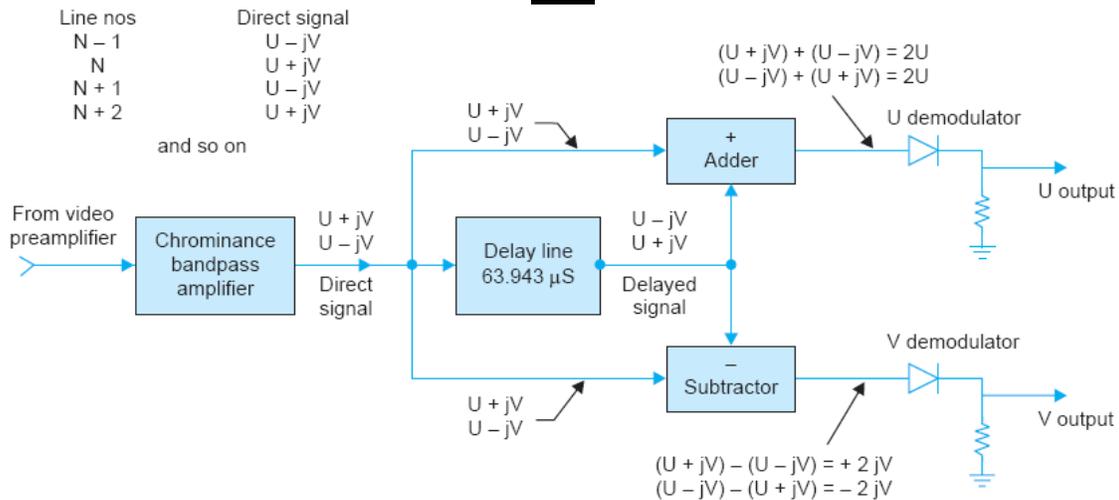
c) Explain how separation of u and v signal is achieved in colour TV. Draw the circuit of RGB drive amplifier used in colour TV.

8M

Ans:



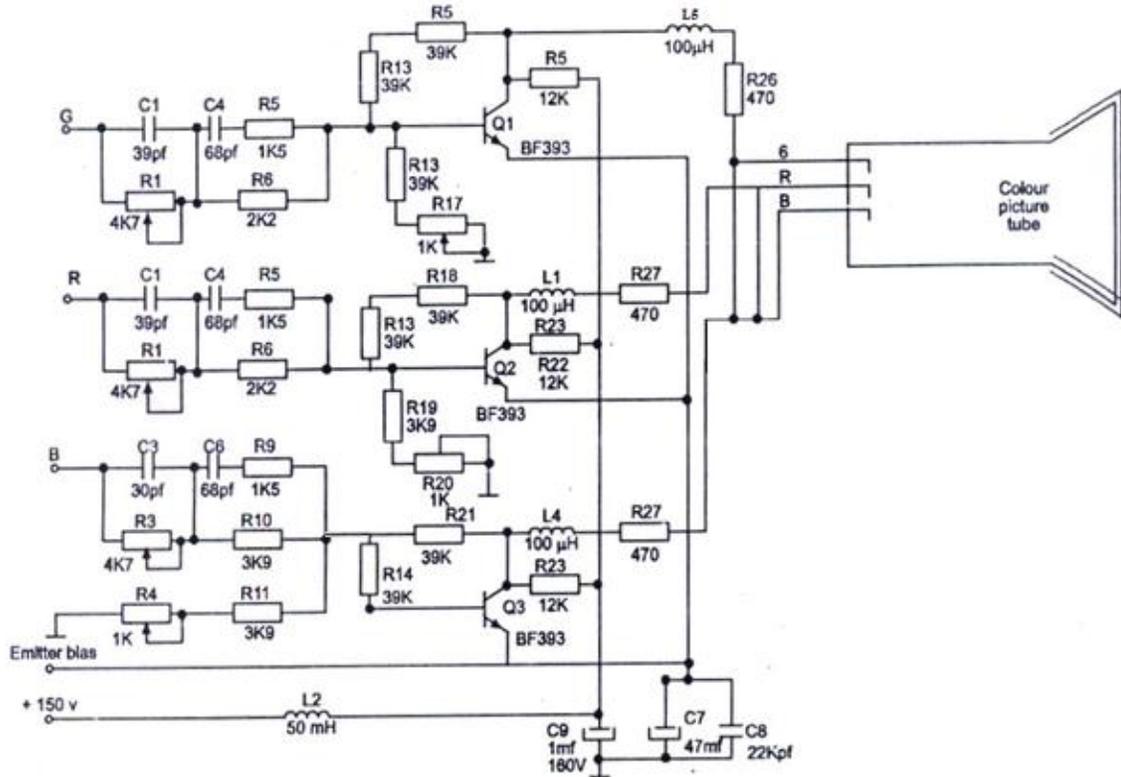
OR



- The basic principle of U & V signal separation by transformer action is shown in fig. It consists of transistor Q1, Transformer T1, PAL delay line & a center tapped transformer T2. The delay line driver transistor Q1 feeds the amplified Chroma signal through transformer T1 into the delay line.
- The signal after passing through the delay line appears across 'A' winding of the transformer T2. Chroma signal is also fed directly at the center tap of transformer T2 through the potentiometer R2. As T2 is center tapped with equal no. of turns in 'A' & 'B', the voltage induced by the signal from delay line will be equal in amplitude but out of phase in winding A & B.
- Thus direct & delayed Chroma signals are applied in the same phase in one winding & out of phase in the other winding. This results in separation of U & V signals.

Note: Any other relevant Circuit can be considered.

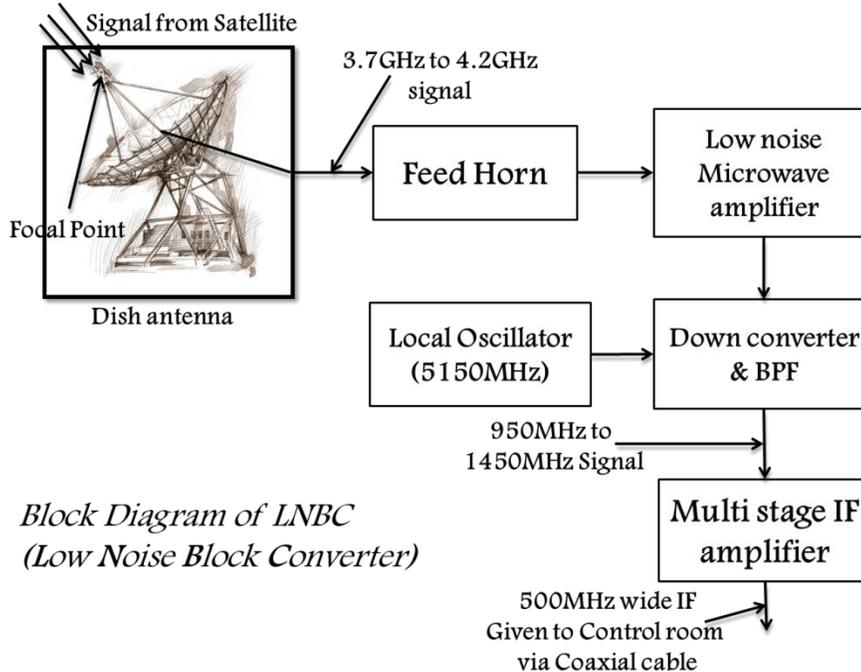
(2M - Diagram (UV separation), 2M - Explanation, 4M - Circuit Diagram)



Q.6	Attempt any four :	16M
a)	Describe multiplexer and attenuator in cable TV with its need.	4M
Ans:	<p>Attenuator:</p> <ul style="list-style-type: none"> An attenuator is an electronic device that reduces the power of a signal without appreciably distorting its waveform. An attenuator is effectively the opposite of an amplifier, though the two work by different methods. While an amplifier provides gain, an attenuator provides loss, or gain less than 1. <p>Need of attenuator:</p> <ol style="list-style-type: none"> To equalize the signal To mix the signal at different proportion Reduces distance by specific value which is expressed in dB <p>Multiplexer:</p> <ul style="list-style-type: none"> In electronics, a multiplexer (or mux) is a device that selects one of several analog or digital input signals and forwards the selected input into a single line. A multiplexer of 2^n inputs has n select lines, which are used to select which input line to send to the output. Multiplexers are mainly used to increase the amount of data that can be sent over the network within a certain amount of time and bandwidth. A multiplexer is also called a data selector. <p>Need of multiplexer:</p> <ul style="list-style-type: none"> In cable distribution center many channel signals are separated, modulated and frequency is allotted to each channel. Now to distribute this channel to users many channel signals must put into one single cable. So multiplexer gives one output from many signals. 	2M each
b)	Describe the working of LNBC with the help of block diagram.	4M

Ans:

Diagram-



Explanation-

- **Dish antenna and feed horn:** A feed horn is actually a flared open waveguide section which is mounted at focal point and its function is to receive signals reflected towards it by the delivers these to the close by located unit called as Low Noise Block Converter (LNBC).
- **Low Noise Amplifier (LNA):** The CVS collected by the feed horn is fed to LNA which is specially designed to provide enough gain which maintains maximum possible S/N ratio.
- **Mixer (down convertors):** Mixer translates the incoming microwave signals to a lower frequency range of 950-1450 MHz. This is achieved by mixing local oscillator frequency of 5150 MHz at mixer and selecting only the difference from output.
- **Band pass filter:** A BPF at the output mixer separates the wanted IF signals from the other signals.
- **Multistage IF amplifier:** It amplifies the down converted signals and then sent through high grade coaxial cable to the CATV station

c) Describe the principle of LCD TV with neat sketch.

Ans:

- LCD technology is quite different to that found in other TV types such as the original CRT (Tube television) and in Plasma TVs. A liquid crystal layer is stimulated by an electrical current, causing individual pixels to either shut out light, or let it pass through.
- In this way each pixel can be either light or dark, and the use of colour filters gives the necessary red, green and blue light with which to create an image of many millions of

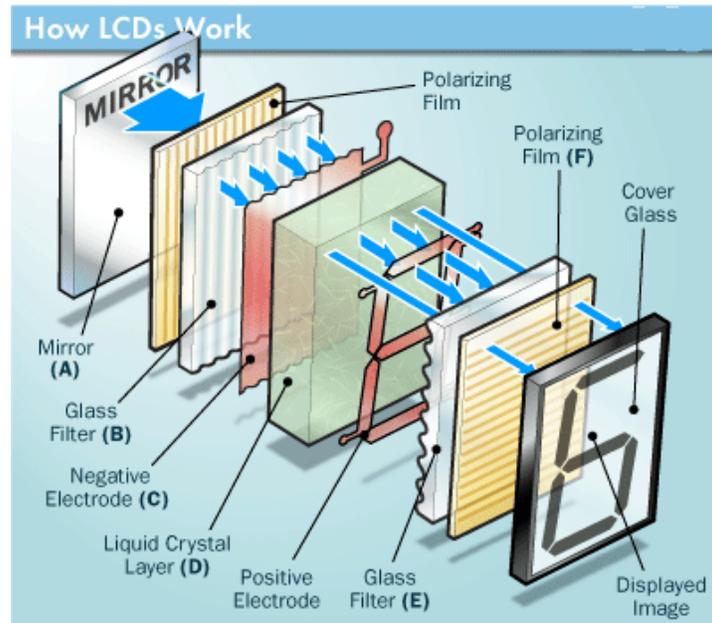
2M

2M

4M

(Diagram -2M, Explanati on-2M)

colours.



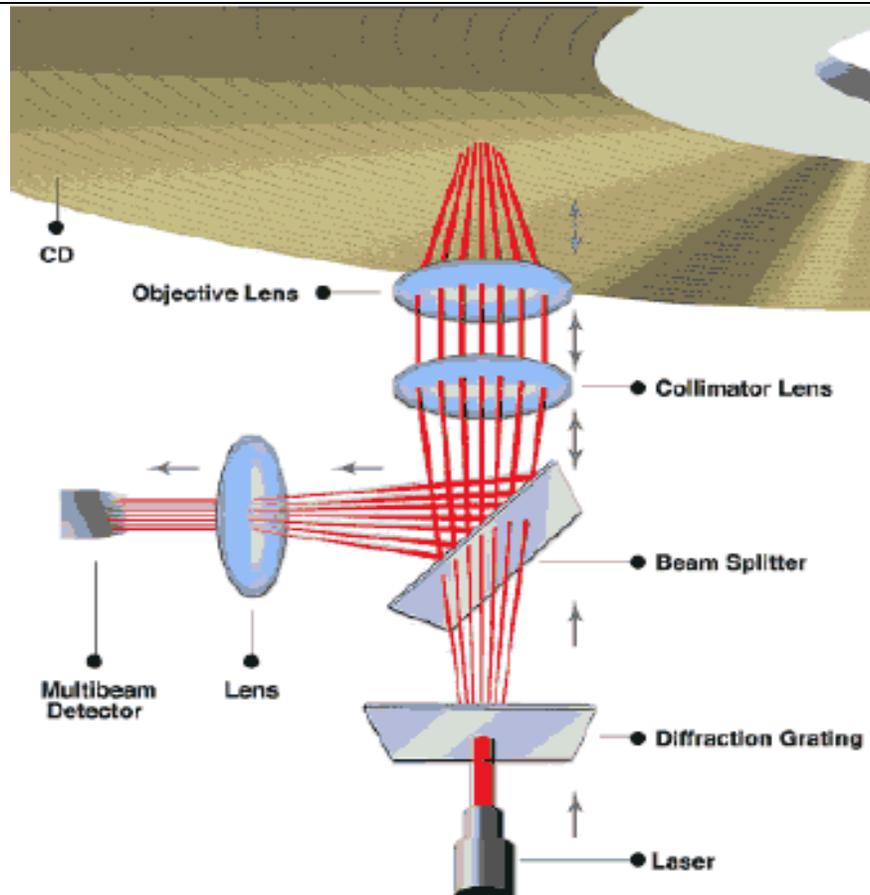
- The main principle behind liquid crystal molecules is that when an electric current is applied to them, they tend to untwist. This causes a change in the light angle passing through them. This causes a change in the angle of the top polarizing filter with respect to it. So little light is allowed to pass through that particular area of LCD. Thus that area becomes darker comparing to others.
- Because the light source is a bulb at the back of the screen, rather than light-emitting phosphors at the front of the screen, this technology is referred to as ‘transmissive’.
- Liquid crystals exhibit some of the qualities of both a solid and a gas. There is uniformity to the structure, but it can be influenced by an electrical current.
- Let’s look at a very basic LCD structure. Two layers of polarized glass encase a layer of liquid crystal. The rear panel of glass is vertically polarized, while the front panel is horizontally polarized. If light was simply shined through from behind, none would emerge from the front.
- Microscopic grooves are cut into each sheet of glass – vertical grooves for the vertically polarized glass, horizontal grooves for the horizontally polarized glass.
- The liquid crystal between the layers of glass then conforms to these grooves, creating a 90-degree twist. Activate the light source now and the liquid crystal will turn the light through 90 degrees so that it emerges from the front.

d) With neat sketch describe the working of pick-up unit of a CD player.

Ans: Diagram:

4M

2M



Explanation:

The pick-up assemble consist of –

- A low power laser diode to illuminate the CD tracks.
- Lens and prism arrangement to direct the laser beam to the CD surface and to direct the reflected laser beam towards photodiode array.
- A photodiode array to obtain data, focus and tracking signal from the reflected laser beam.
- Focus and tracking coils to focus the beam to the CD surface and to move the assembly to proper track across the disc surface.
- Some optical units do not contain the tracking coil, for example, the single-beam radial tracking assembly, this is explained in latter sections.
- Optical arrangement in a single-beam radial tracking pick-up assembly :
- In the optical pickup unit, the laser diode emits laser beam from a small point into an elliptical or conical distribution. This beam is passed through various prism and lens to form a very small diameter light beam on the disc surface at the center of the track.
- The objective lens is controlled by the tracking and focusing coil to keep the beam focused on the CD and to keep the condensed beam at the center of the track.
- This laser beam is reflected back by the flat area and the pits on the disc surface. This reflected beam is applied to a group of photodiodes through objectives lens,

2M

collimator lens and some prism arrangement.

e) Distinguish between CATV and CCTV (any four points).

4M

Ans:

Cable Television (CATV)	Closed Circuit Television(CCTV)
The CATV monitor has RF, IF as well as detector stages.	CCTV monitors does not have RF, IF and detector stages.
Audio section is present	Audio section is not present.
Pay-Tv channels are present in CATV with additional fees.	Pay-Tv channels are not present.
Internet services can be provided	Internet service cannot be provided.
CATV service provider can broadcast live programs from studios, some events etc. on their local TV channels	Such facilities are not available
Various channels such as scientific, geographic, sports news, entertainment etc. are provided by CATV.	Such channels are not provided in CCTV.
CATV system is huge system covering not only a small community but also large areas rather a whole city.	CCTV can cover only small area where it is installed for example a hospital, college etc.
Camera range of CATV is more with higher resolution.	CCTV camera range is limited to only some distance with less resolution.
Applications: CATV's are used in homes, malls, shops for entertainment and value added services and in corporate and business environment for internet services.	Applications: It is used for surveillance in college campus, industry, traffic control, crowd control and also used for medical care and safety.

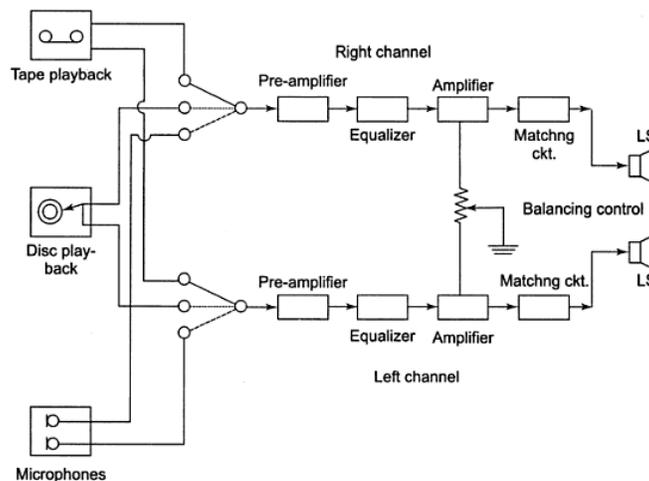
1M each point (Any 4 Points)

f) Draw the block diagram of Hi-Fi amplifier and state the function of controls available on it.

4M

Diagram:

2M



Block diagram of hi-fi reproducing system



Functions:

Balance Control:

Two amplifiers of a stereo system, although independent of each other, are built as matched pair to give equal output for the same input. In spite of the two amplifiers being identical, there may be variations in the output of each channel due to variations in the characteristics of transistors & ICs and positioning of loudspeaker & furnishing with respect to the listener. The circuit used is called BALANCE CONTROL.

Master Gain Control:

A master gain control is used for adjusting overall volume without disturbing the balance. This is achieved by using dual concentric shafts, the inner shaft adjusts the balance control & the outer shaft, the overall gain or volume of the amplifier.

Blend Control:

The stereo effect is diluted by this control when there is too much left-right effect. Diluting is done by misbalancing the two channels.

Quasi Stereo Switch:

When any one channel signal is made to go into both the channels, one can use both channels & their speakers for monophonic source of signal. This is done by a switch called quasi-stereo switch.

Bass & Treble Control:

It is provided to tailor bass & treble as per personal taste of listener.

Loudness Control:

Sometimes music is at low level of volume. At low levels there is considerable loss in bass in reproduction. It is, therefore necessary that there should be substantial boosting of bass at low levels. Boosting at treble may be only nominal because loss at high notes is quite small. The control which provides desired boosting at bass & at treble is called Loudness Control.

2M