

**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.****A Attempt any three:****12M****a) Differentiate between stereo amplifier and mono amplifier.****Ans : (any four relevant points)****01 M each**

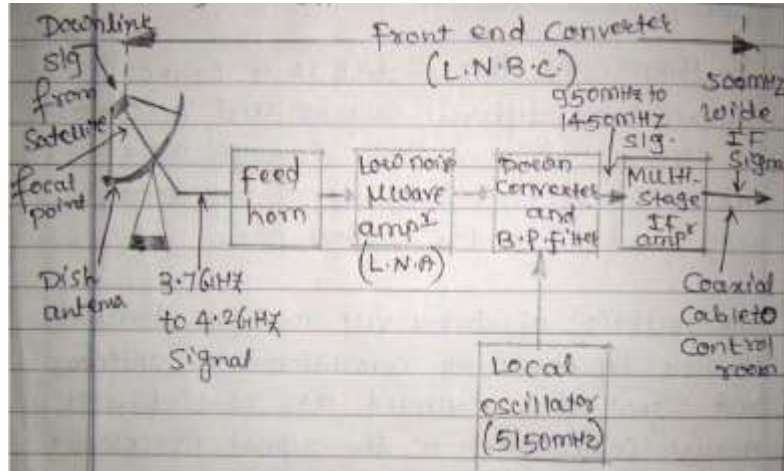
SR.No	Stereo amplifier	Mono amplifier
1	Stereo means solid and phone is sound in Greek, means three dimensional sound.	Mono means one sound or one dimensional sound.
2	Sound arises from the two different amplifiers so that sound appears to be surrounded.	Monophonic sound system has one source
3	It has 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.

b) Draw the LNBC unit in the dish antenna.

Ans:-

Diagram:-

04M



c) State the CCIR-B standards for colour signal transmission and reception (any eight).

Ans. (any eight standards)

½ M each

<u>Parameters</u>	<u>CCIR B standard</u>
Number of scanning lines/frame	625
Field (vertical) frequency	50Hz
Line(horizontal) frequency	15625Hz
Aspect ratio(width/height)	4:3
Horizontal trace time	52µs
Horizontal retrace time	12µs
Total scanning line lost in vertical retrace	64µs
Front porch	1.5µs
Back porch	5.8µs
Horizontal sync pulse	4.7µs
Colour sub carrier frequency	4.43MHz
Colour system	Phase Alteration by Line -Delay (PAL-D)
U signal(weighted B-Y)	<u>U=0.493 (B-Y)</u>
V signal(weighted R-Y)	<u>V=0.877(R-Y)</u>
Total vertical blanking duration	1280µs or 1.280ms
Vertical sync pulse	160µs
Pre and post equalizing pulse	5 pulse each
Sync pulse top	100%
Blanking/pedestal level	75%
Black level	72-75%
White level	10-12.5%
Width of video signal	5MHz
Chroma signal bandwidth	-1.3MHz to +1.57MHz
Video IF	38.9MHz



d) State any four advantages of fluorescent display system.

Ans: (any four advantages)

01 M each

- Displays the pitch of the channel, band etc.
- Helps the listener to adjust the pitch of his interest by seeing the display.
- Helps to know the voice band when using the karaoke system.
- Uniform brightness, low cost etc.
- In addition to ten numerals, the display can be used to show letters including punctuation.
- It gives hexadecimal encoding for display the digits 0 to F.
- To remove the ambiguity letter „B' is small „b' and number „8“ is in 7 segment display, otherwise both would have looked same.
- It can give short message giving status information in CD player like “no disc” or “error” etc.
- The fluorescent numbers and messages can be seen in the dark also.

Q.1.

B) Attempt any one:

06M

a) What is working principle of TV camera tube? State different types of camera tube and explain any one.

Ans:- ( working principle 1 marks + types of camera tubes 1 mark + explanation 4 marks with diagram )

Basic principle:-

01M

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.

Types of camera tubes:

01M

- Image Orthicon
- Vidicon
- The Plumbicon
- Silicon Diode Array Vidicon
- Solid State Image Scanners

**Explanation :-**

04M

**1. Image Orthicon**

This tube makes use of the high photo emissive sensitivity obtainable from photocathodes, image multiplication at the target caused by secondary emission and an electron multiplier. A sectional view of an image orthicon is shown in Fig. 6.3. It has three main sections: image section, scanning section and electron gun-cum-multiplier section.

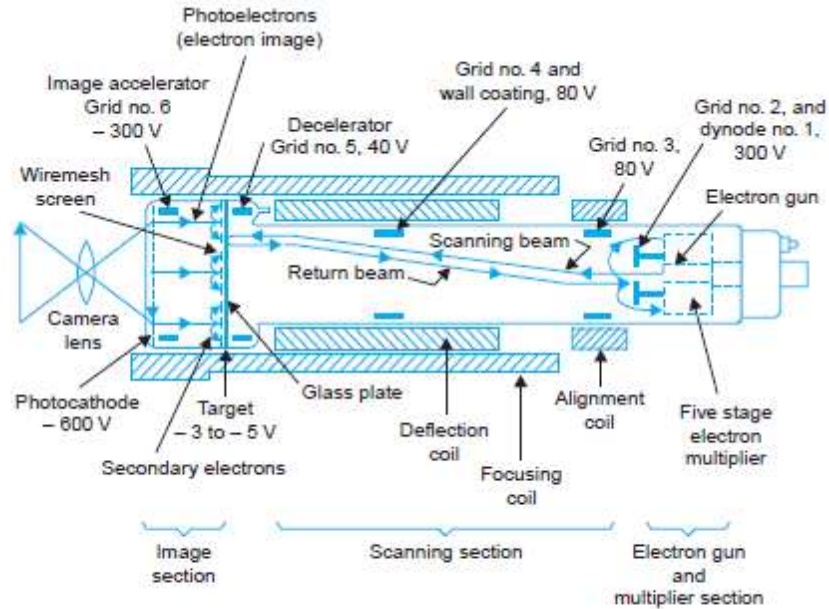


Fig. 6.3. Principle of operation of Image Orthicon (non-field mesh type).

OR

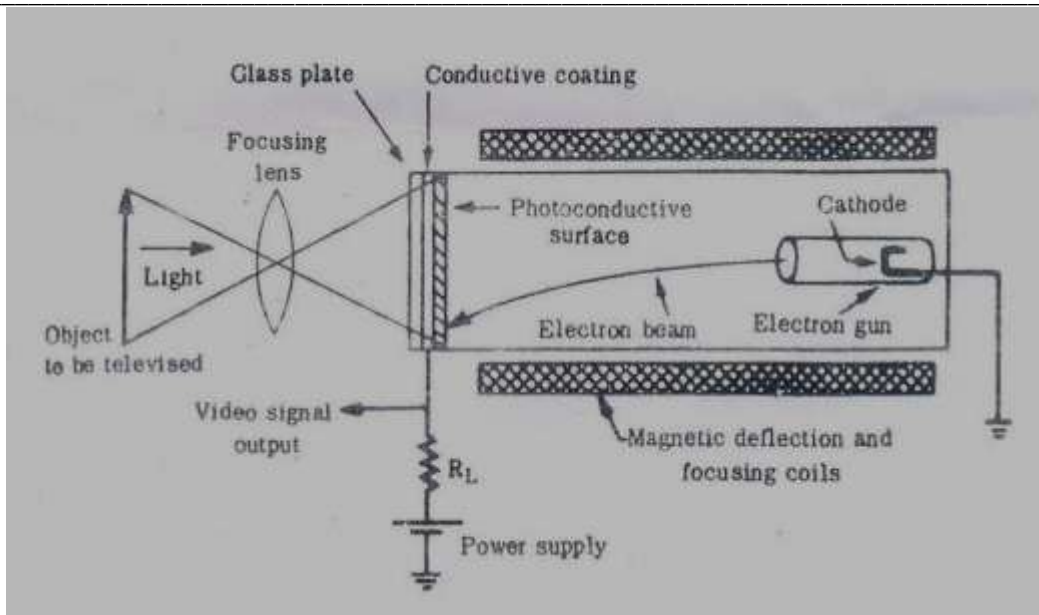
**2. Vidicon Camera Tube.**

The vidicon tube operates on the principle of photo conduction. When light falls on a photo conductive plate, the conductivity of target plate varies according to the intensity of light falling on target plate, this is called as photo conduction. It makes use of the photo conductivity of certain semiconductor material as antimony tri-sulphite.

The photo conductive material is a semiconductor changing with light and storing small are of charge.

The target of the tube consist of transparent film of conducting surface.

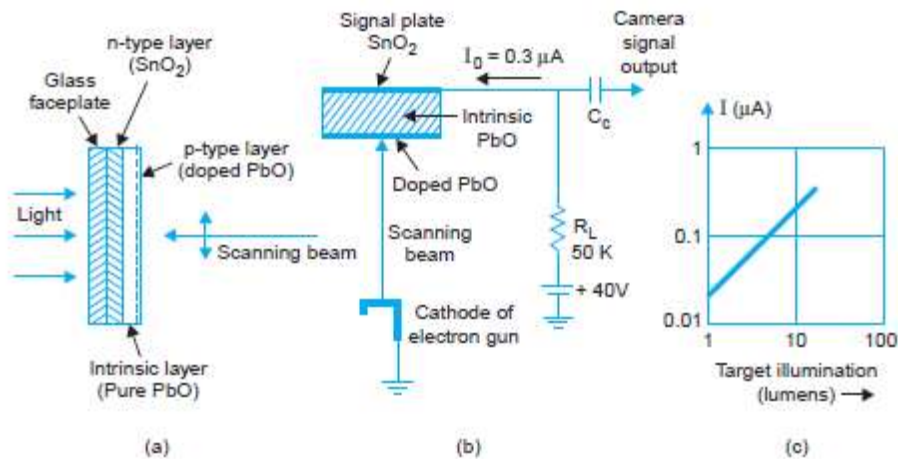
It has just photo conductivity layer target plate and the e gun along with focusing and scanning coil with optical image focused on the target. It produces a charge image that is scanned by e form the gun to develop video signal across a load resistor. This video signal obtained is proportional to the optical image.



OR

3. Plumbicon

Except for the target, plumbicon is very similar to the standard vidicon. Focus and deflection are both obtained magnetically. Its target operates effectively as a P-I-N semi-conductor diode. The inner surface of the faceplate is coated with a thin transparent conductive layer of tin oxide ( $\text{SnO}_2$ ). This forms a strong N type ( $\text{N}^+$ ) layer and serves as the signal plate of the target. On the scanning side of this layer is deposited a photoconductive layer of pure lead monoxide ( $\text{PbO}$ ) which is intrinsic or 'I' type. Finally the pure  $\text{PbO}$  is doped to form a P type semiconductor on which the scanning beam lands. The details of the target are shown in Fig. The overall thickness of the target is  $15 \times 10^{-6}$  m. Figure shows necessary circuit details for developing the video signal. The photoconductive target of the plumbicon functions similar to the photoconductive target in the vidicon, except for the method of discharging each storage element.



OR

**4. Solid state image scanners**

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 signals—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 Fig. 6.12. 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, are deposited on the insulator film. This results in the creation of a very large number of tiny MOS capacitors on the entire surface of the chip.

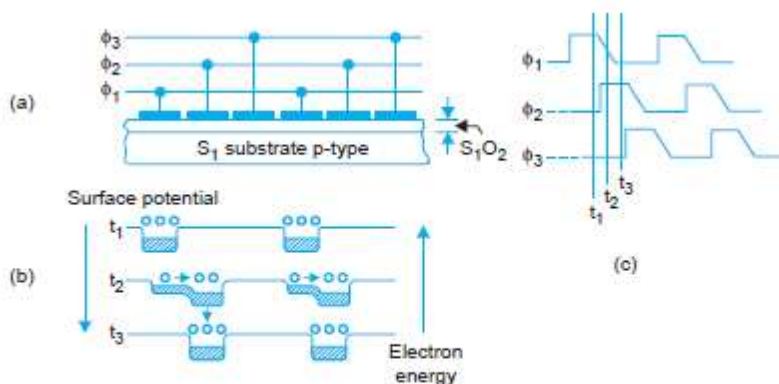


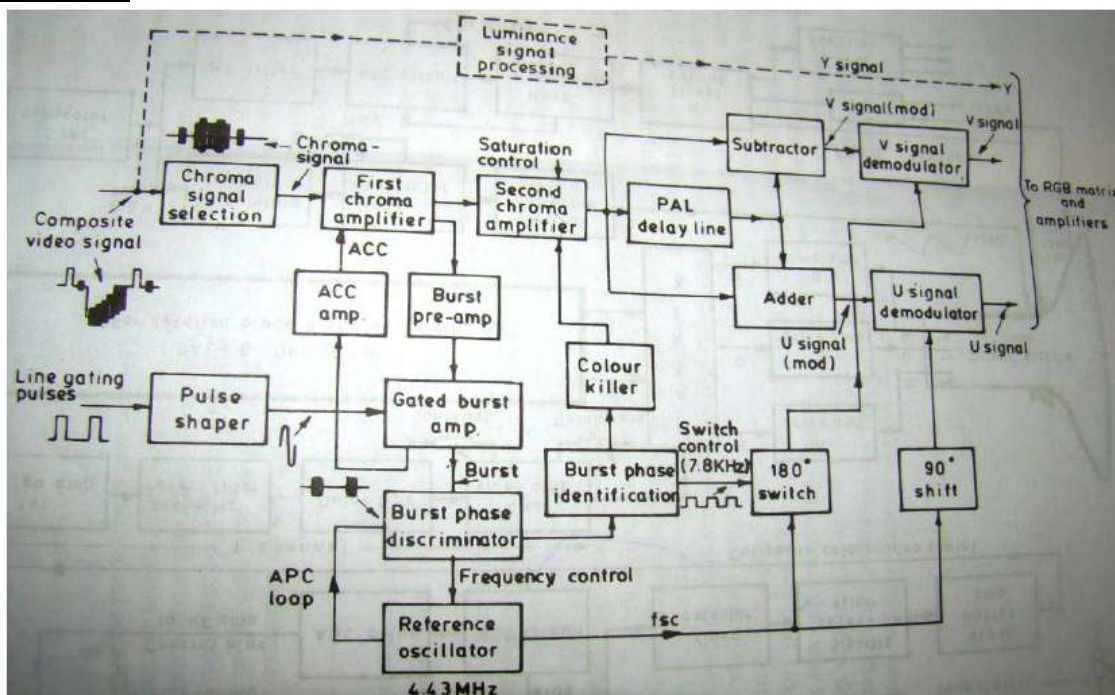
Fig. 6.12. A three phase n-channel MOS charge coupled device. (a) construction (b) transfer of electrons between potential wells (c) different phases of clocking voltage waveform.

b) Draw and explain the block diagram of PAL-D decoder.

Ans:-

Diagram:-

03M



**Explanation:**

03M

**Chroma signal selection:**

Its function is to select chroma and colour burst signal from the incoming CCVS signal by chroma signal selection circuit. It essentially consist of band pass circuit whose centre 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 colour phasor):**

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 a dc voltage whose magnitude and polarity are proportional to the magnitude and direction of the detected phase difference.

**Burst phase identifier:**

This circuit is able to identify the phase relationship of the colour burst.

**180°switch:**

This switch is used to periodically invert the waveform fed to the v-signal demodulator.

**Colour killer control:**

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 cutoff state.

Q.2) Attempt any four:-

16M

a) State working principle of LCD with neat diagram.

Ans:

Working Principle:-

01M

LCD TV has two sheets of polarized glass plates with some Liquid Crystal Solution trapped between them, forcing the liquid crystal into a twisted structural arrangement

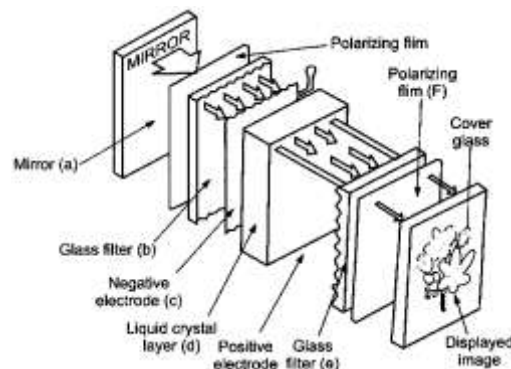
Working:-

01M

- LCD TV uses the LCD Display technology to produce images.
- LCD is a form of visual display technology that functions by sandwiching a layer of liquid crystals between two transparent electrodes or conductive surfaces.
- Liquid Crystals are specialized molecules that flow like liquids but polarize light like solid, crystalline structures.
- LCD technology works by selective passage of light, which passes through millions of individual LCD structures.
- These shutters are arranged in grids and constitute coloured filters, allowing only the RGB portion of the light to pass through white light are typically provided by a series of CCFLs (Cold Cathode Fluorescent Lamps), which are rear of the screen.
- Every single sub – pixel is formed by a shutter filter combination, and these sub – pixels blend together to form whole picture.

Diagram:-

02M



b) Explain the details of Horizontal sync pulse.

Ans:-

Explanation:-

02M

Out of a total line period of  $64 \mu\text{s}$ , the line blanking period is  $12 \mu\text{s}$ . During this interval a line synchronizing pulse is inserted. The pulses corresponding to the differentiated leading edges of the sync pulses are actually used to synchronize the horizontal scanning oscillator. This is the reason why in Fig. 3.3 and other figures to follow, all time intervals are shown between sync pulse leading edges.

The line blanking period is divided into three sections. These are the 'front porch', the 'line sync' pulse and the 'back porch'. The time intervals allowed to each part are summarized below and their location and effect on the raster is illustrated in Fig. 3.3.

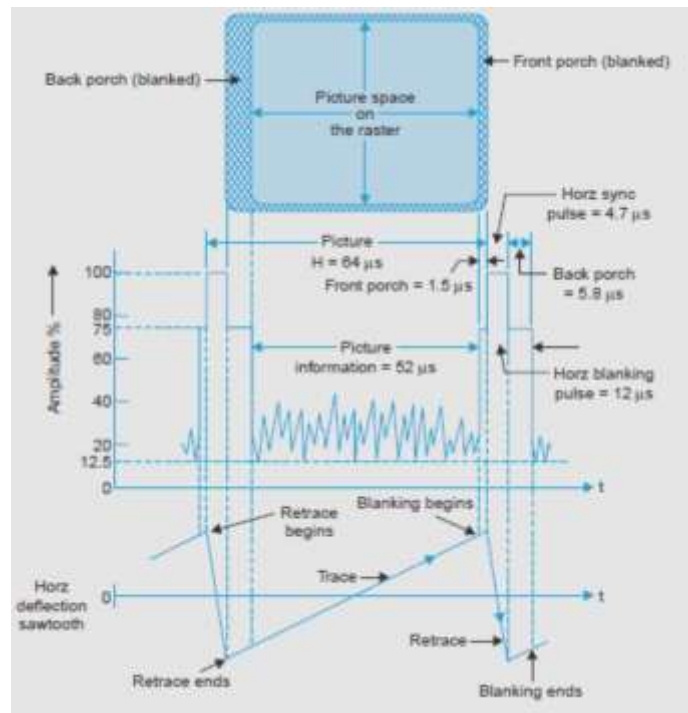


**Details of Horizontal Scanning**

Period	Time ( $\mu\text{s}$ )
Total line ( $H$ )	64
Horz blanking	$12 \pm .3$
Horz sync pulse	$4.7 \pm 0.2$
Front porch	$1.5 \pm .3$
Back porch	$5.8 \pm .3$
Visible line time	52

Diagram:-

02M

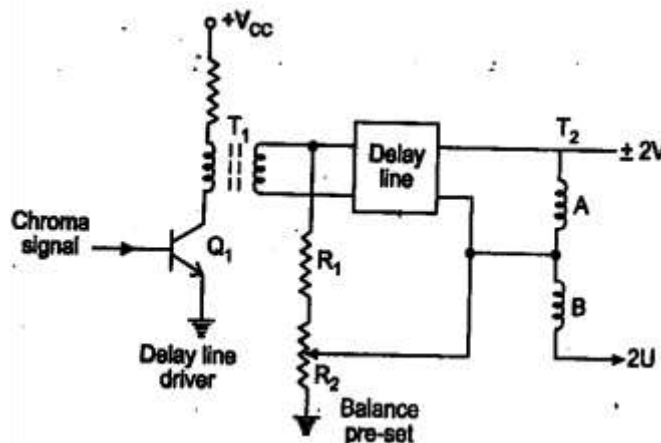


c) Explain how U and V signals are separated in colour TV system.

Ans:

Diagram:-

02M



**Explanation:-****02M**

Chroma signal is applied to Q1. Chroma signal is applied to delay line through transformer T1. This signal after delay line appears across A winding. Direct signal is fed to center top of T2 transformer. Voltage induced into winding A and B is equal in magnitude but opposite in phase due to signal from delay line. Whereas voltage induced into winding A and winding B is equal in magnitude and same phase. This means that direct and delayed signals have same phase in one winding but are of opposite phase in second winding. Thus results in separation of U and V signal.

**d) Enlist the different types of CD Lenses used in CD player. Explain any one.**

**Ans:**

**Type of CD Lenses used in CD player:-****02M**

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

**Explanation:- (Any one)****02M****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.

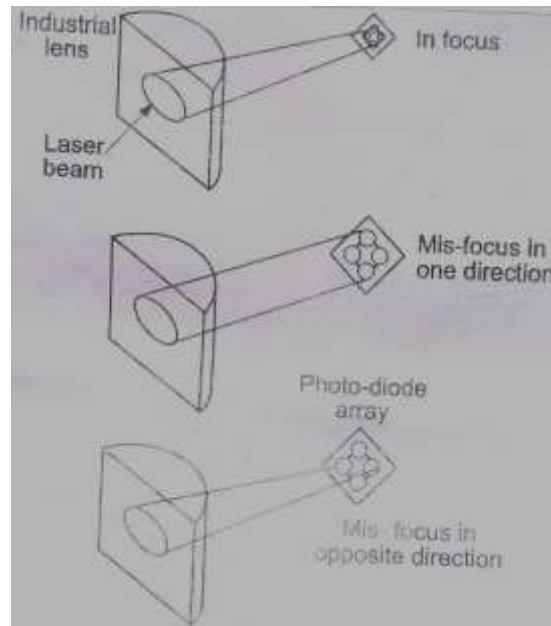
This lens is moved up/down to achieve the focus of the laser beam on the disc face. The objective lens is always kept in focus using a system similar to the voice is system used the audio speakers. It is also moved horizontally in the linear pick-up assembly to keep the laser am in proper track. In players that used the radial tracking method the objective is unit does not move horizontally (laterally).

**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.

As shown in the fig. when the beam is correctly focused a circular beam of light will land on the four photo-diode elements. If the beam becomes out of focus the cylindrical lens will distort the beam

elliptically. As shown in the fig. the torsion depends upon the direction of mis-focus. This distortion is known as astigmatism.



e) Describe NHK MUSE system for HDTV.

Ans

**Explanation:-**

**02 M**

- 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 10MHz.
- 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 sub – sampling pattern over a four – field sequences.
- The stationary areas of the picture are reconstructed by temporal interpolation of samples from four fields.

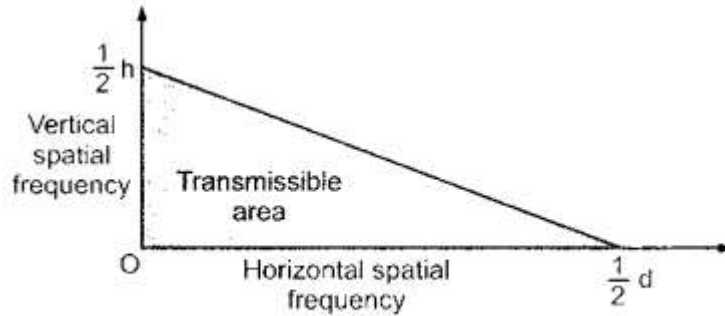
**Spatial Interpolation**

- 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.
- The lack of resolution during movements of the entire scene as in case of camera panning, zooming or tilting is prevented by introducing spatial motion compression technique.
- A vector representing the motion of the scene is calculated for each field at the encoder. This signal is multiplexed in the vertical blanking interval and transmitted to the receiver.
- In decoder, the read – out addresses of picture elements (pixels) from previous fields are shifted according to the information provided by the motion vector so that the data can be processed in still – picture mode.

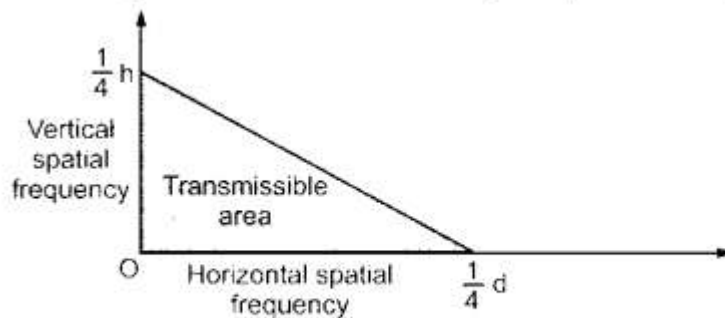
- These two modes of interpolation, the inter – frame processing for stationary pictures and infra field averaging for moving portions of the picture are switched by detecting the moving areas at the decoder.
- Audio transmission is done by 4 – phase DPSK which is multiplexed with the processed video signal in the vertical blanking interval after frequency modulation of the transmission carrier by the video signal.

Diagram:-

02M



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



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

f) Draw the three way cross over n/w with its frequency response graph.

Ans:-

Diagram:-

02M

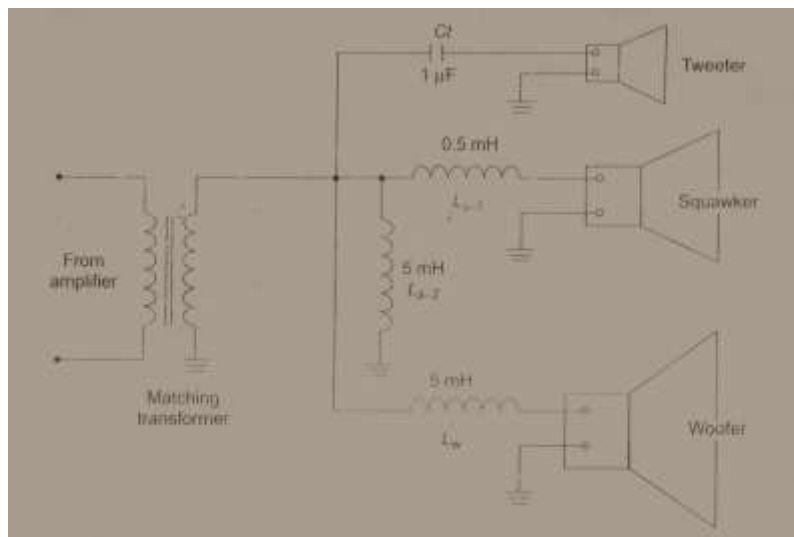


Fig. Three way cross over network.

Frequency Response:-

02M

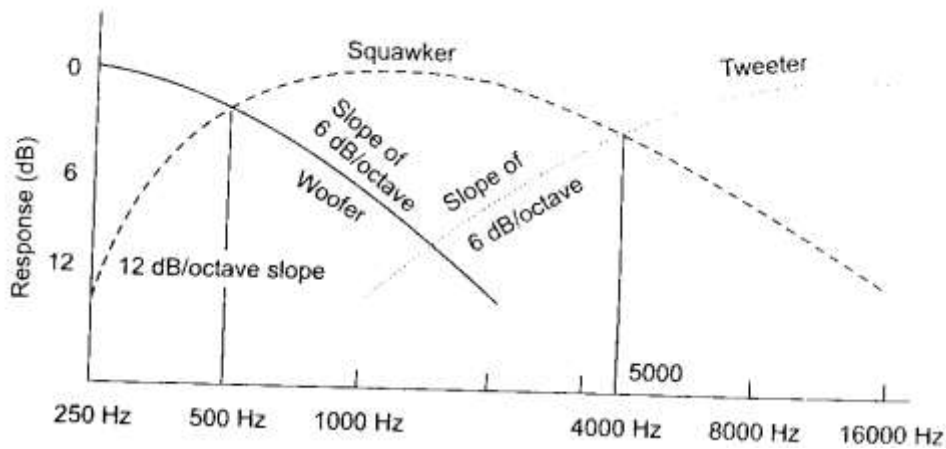


Fig. frequency response of three way cross over n/w.

Q3) Attempt any four:

16M

a) Explain use of multiplexer in cable TV.

Ans:

*(NOTE:- Any valid point can be considered.)*

Need of multiplexer:

02M each

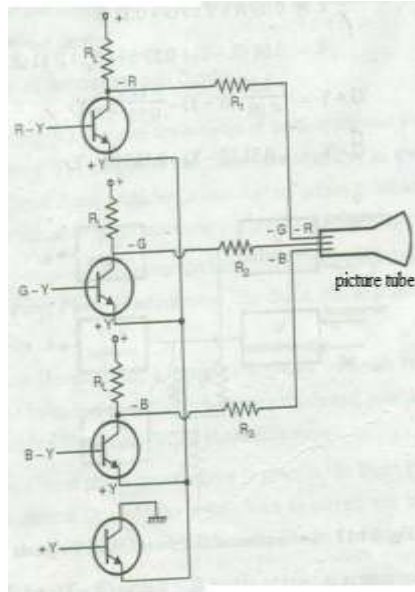
1. In cable distribution center many channel signals are separated, modulated and frequency is allotted to each channel.
2. Now to distribute this channel to users many channel signals must put into one single cable. So multiplexer gives one output from many signals.

b) Draw and explain working of RGB drive amplifier in colour TV.

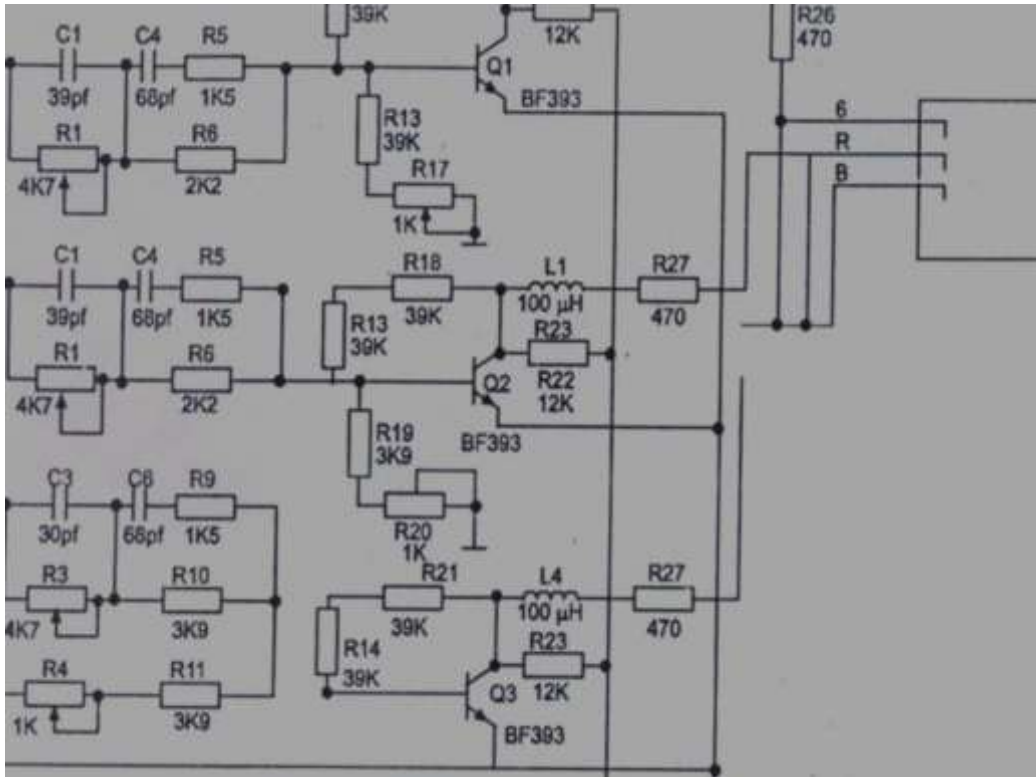
Ans:

Diagram:-

02M



OR



**Explanation:**

**02M**

RGB amplifier circuit consists of three identical video amplifiers for driving the 3 cathodes of picture tube. The inputs of amplifiers obtained from the decoded red, green and blue outputs of Chroma IC. Q1, Q2, Q3 are high frequency transistor of type BF393 or BF 869. The 3 amplifiers are of same design so their frequency response is nearly same. 3 amplifiers are identical so only 1 is considered to explain. Q1 of green signal amplifier is connected in CE configuration. 150 V dc supply is filtered by L2 and C9, C7 and C8 are bypass to the emitter supply. R15 and R12 provide negative feedback to improve dc stability. L3 in the collector load used to extend bandwidth. C1 at input to amplifier is to improve step response.

The d.c. collector voltage, determines the picture tube cut-off voltage is fixed by R17. R1 is varied for monochrome reproduction at high lights.

c) Draw the block diagram of Hi-Fi amplifier and explain it in details.

Ans:

**Explanation:-**

**02M**

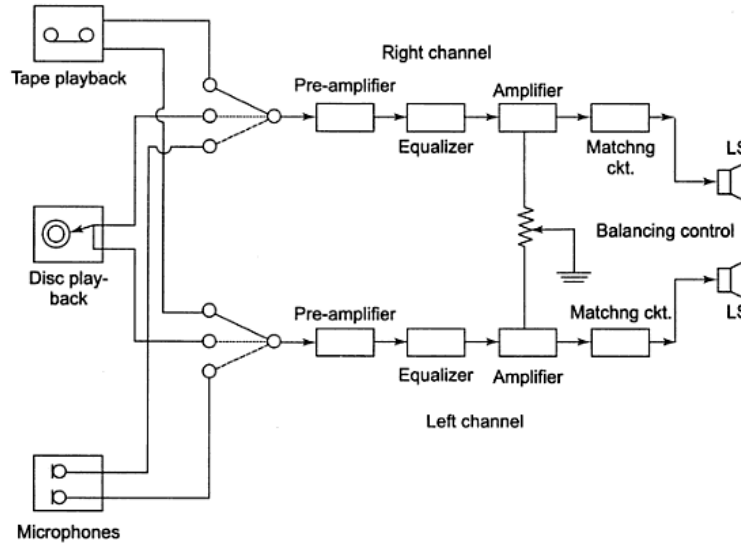
High- fidelity sound can be obtained from the recorded stereo tape or in live system from the microphones. (stereo signal can also be obtained from the record player.)

The stereo signal is fed to two independent amplification channels through a tape-mic switch. The amplifier system consists of a low noise high gain pre-amplifier, equalizer, well designed amplifier giving flat frequency response and little distortion by using negative feedback circuit and then the matching transformer. (A balancing circuit is incorporated to balance out then the matching the characteristics of otherwise identical circuits.). The Secondary of the matching transformers of each channel I connected to the respective loudspeaker column. For hi-fi, the loudspeaker columns consisting of woofer, squaker and tweeter are used.

All the blocks are designed so as to get flat frequency response(from 40 to 15000 Hz). little distortion (less than 1%), high signal-to-noise ratio(more than 50dB) and high dynamic range (100 dB) to achieve the final output of high fidelity.

Diagram:-

02M



Block diagram of hi-fi reproducing system

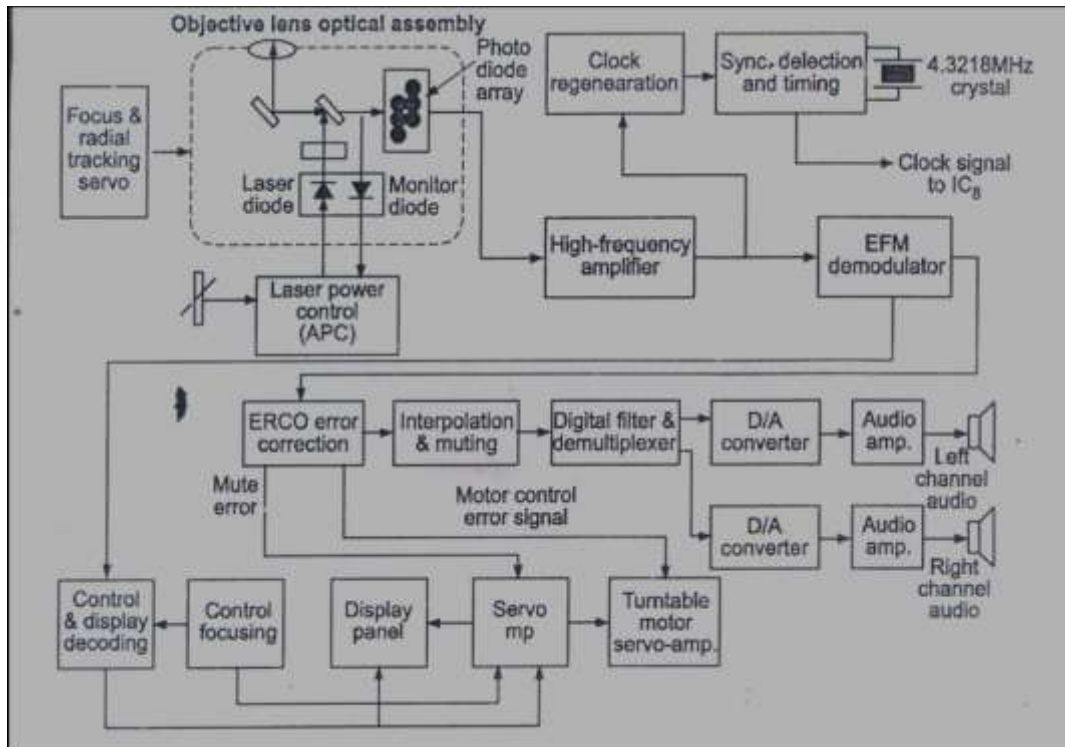
Figure: Block diagram of Hi-Fi audio amplifier system

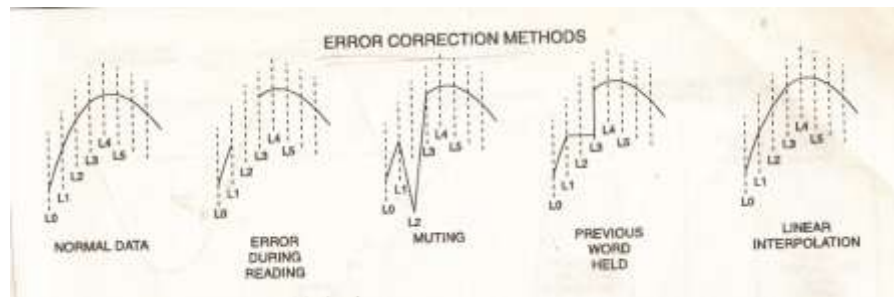
d) Draw the block diagram of CD player. Explain how errors are corrected in ERCO block.

Ans:

Block diagram of CD player:

02M



**Block diagram of ERCO :****Explanation:-****02M****ERCO Circuit:**

Demodulated data from EFM demodulator is sent to error correction (ERCO) circuit. The demodulated data signals also send to control and display decoding circuit, which recovers the control and display signals which are further multiplexed into signals received from CD.

**Interpolation and muting:**

Any error found in the incoming data signal is sent to interpolation and muting section by the ERCO circuit. This information is sent with a flag signal indicating the type of action to be performed to correct the error.

- Last word held
- Linear Interpolation

**Previous word held:**

When the analog signal is sampled, each sample is given a 16 bit word value. A 16 bit word can have 65,536 different values. Normally an audio signal is a smooth analog wave, so if any data is missing from the data stream read from the disc, it can be assumed that the missing is previous word.

A difference of only  $1/65526$  is such a small difference that no human being can detect it. So, in this method of “**Previous word held**” the missing data in a sound stream is filled with the data from the previous word in the stream.

**Linear interpolation:**

This method is an improvement to the last method of “**Previous word held**”. In this “**Linear Interpolation**” method the value of the word before the error word and the value of the word after the error word is taken and the average of the sum of these two numbers are taken as replacement for the missing word.

As you can see in the fig this method will provide a better solution for any lost data.

**d) Give frequency range in TV channel allocation for band I and band III.**

**Ans:-**

**Band I 02M, Band III 02M**





<i>Band</i>	<i>Channel No.</i>	<i>Frequency range</i>
BAND I (41-68 MHz)	1	41-47 (not used)
	2	47-54
	3	54-61
	4	61-68
BAND III (174-230 MHz)	5	174-181
	6	181-188
	7	188-195
	8	195-202
	9	202-209
	10	209-216
	11	216-223
	12	223-230

f) What is the graphic equalizer? Write its necessity.

Ans:

04M

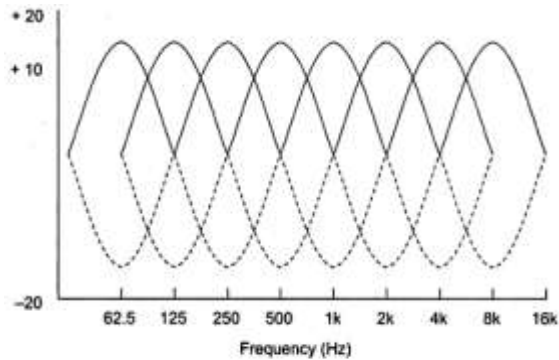


Fig. Boost/cut for bands at frequencies centered one octave wide

OR

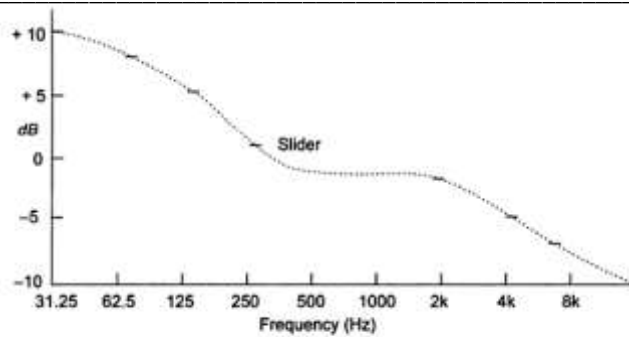


Fig. Position of sliders of graphic equaliser to get a specified response curve (dotted line)

**Graphic Equalizer:**

- 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.

Q4)

A) Attempt any three:

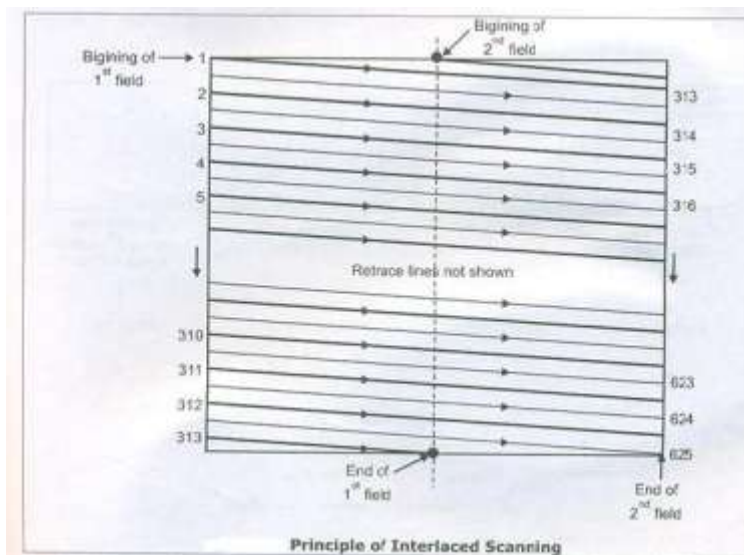
12M

a) Explain interlaced scanning in TV system with neat sketch.

Ans:-

**Diagram:-**

02M



**Explanation:-****02M**

In television pictures an effective rate of 50 vertical scans per second is utilized to reduce the flicker. This is accomplished by increasing the downward rate of travel of the scanning electron beam, so that every alternate line gets scanned instead of successive line.

- Then when the beam reaches the bottom of the picture frame it quickly returns to the top to scan those lines that were missed in the previous scanning.
- Thus, the total number of lines is divided into two groups called 'fields'. Each field is scanned alternately. This method of scanning is called interlaced scanning'.
- In the 625 line TV system, for successful interlaced scanning, the 625 lines of each frame or picture are divided into sets of 312.5 lines and each set is scanned alternately to cover the entire picture area.
- To achieve this, the horizontal sweep oscillator is made to work at a frequency of 15625 Hz (i.e.  $312.5 \times 50 = 15625$ ) to scan the number of lines per frame, but the vertical sweep circuit is run at a frequency of 50 Hz (i.e.  $25 \times 2 = 50\text{Hz}$ )
- Note that since the beam is now deflected from top to bottom in half the time and horizontal oscillator still operating at 15625 Hz, only half the total lines (i.e. 312.5) get scanned during each vertical sweep.
- Since the first field ends in a half line and the second field starts middle of the line on top of the screen, as shown in fig., the beam is able to scan the remaining 312.5 alternate lines during its downward journey.
- The beam scans 652 lines per frame at the same rate of 15625 lines per second. Therefore, with interlaced scanning the flicker effect is eliminated without increasing the speed of scanning, which in turn does not need any increase in channel bandwidth.

**b) State merits and demerits of negative modulation.****Ans:****Merits of Negative Modulation: (any two)****02M**

- Lesser noise interference on picture signal.
- Possible to obtain larger peak power output.
- Less picture signal distortion.
- Easy to develop true AGC voltage.
- More efficient operation.
- More power available from the transmitter
- Saving in transmission power

**Demerits of Negative Modulation: (any two)****02M**

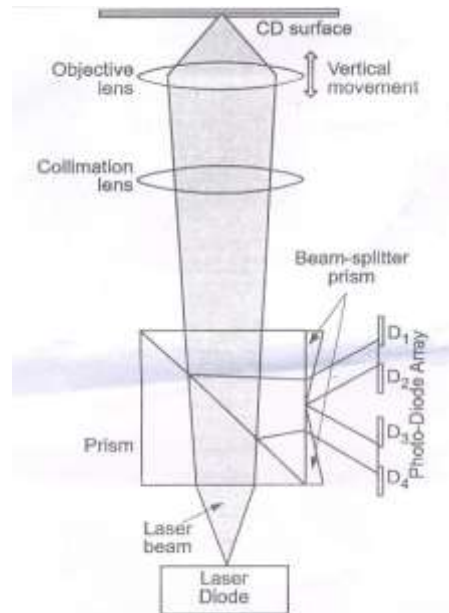
- The synchronization of the receiver is affected by spurious random pulses produced due to the effect of noise.
- The loss of horizontal and vertical synchronization may cause diagonal or vertical rolling of picture.

c) Draw and explain CD pick up assembly in CD player.

Ans:-

Diagram:-

02M



Explanation:-

02M

Pick up assembly:

The pick-up assembly consists 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 photo-diode array.
  - A photo diode 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.

Optical arrangement in a single-beam radial tracking pick-up assembly:

- In the optical pick-up 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 photo-diodes through objectives lens, collimator lens and some prism arrangement.
- These photo-diodes induce voltage according to the reflected beam falling on it. Focus error and tracking error voltage generated by this photo-diode array is applied to the tracking and focusing coil to control the objective lens and data signal generated by this photo-diode array is sent to an amplifier to amplify the data signals

picked-up from the disc. Finally, the output from the amplifier is processed to produce the audio signal stored on the disc surface.

d) Draw and explain the block diagram of DTH system.

Ans:

Explanation:-

02M

- 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.
- The technology was developed for competing with the local cable TV distribution services by providing higher quality satellite signals with more number of channels.
- 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 satellites compress the signals digitally, encrypt them and then are beamed from high powered geostationary satellites. They are received by dishes that are given to the DTH consumers by DTH providers.
- Though DBS and DTH present the same services to the consumers, there are some differences in the technical specifications.
- While DBS is used for transmitting signals from satellites at a particular frequency band [the band differs in each country], DTH is used for transmitting signals over a wide range of frequencies [normal frequencies including the KU and KA band].

Diagram:-

02M

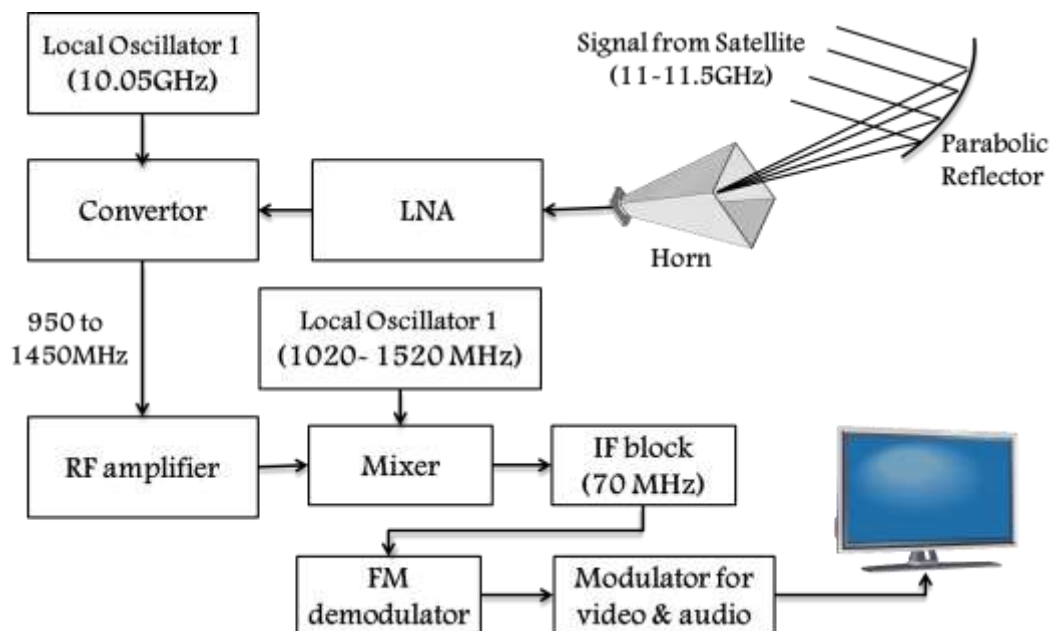


Figure: Block diagram of DTH system

**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 converter. The output of converter 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.

Q4

B) Attempt any one:

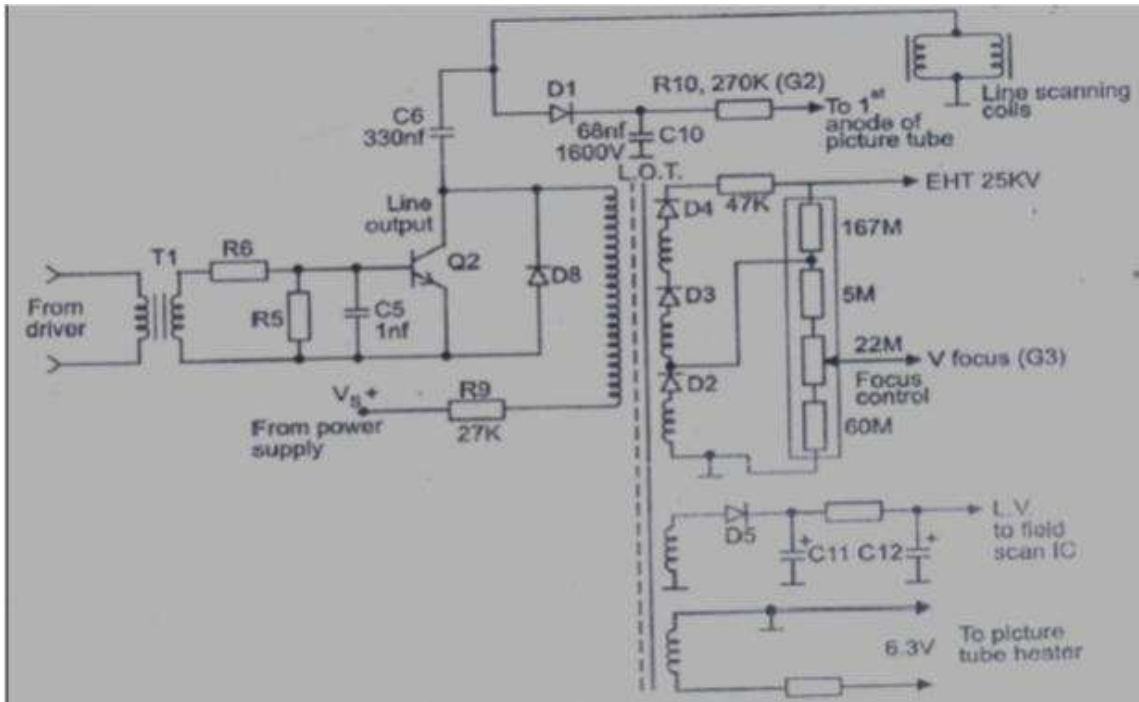
06M

a) What is the need of EHT? Explain how it is generated.

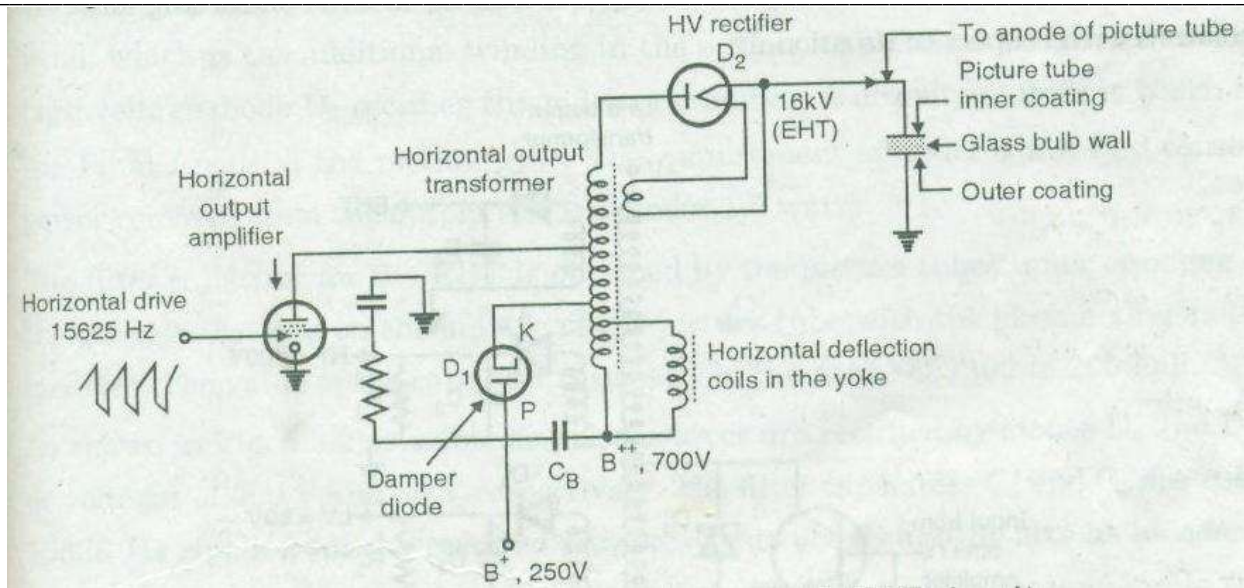
Ans:

**Diagram:-**

03M



OR



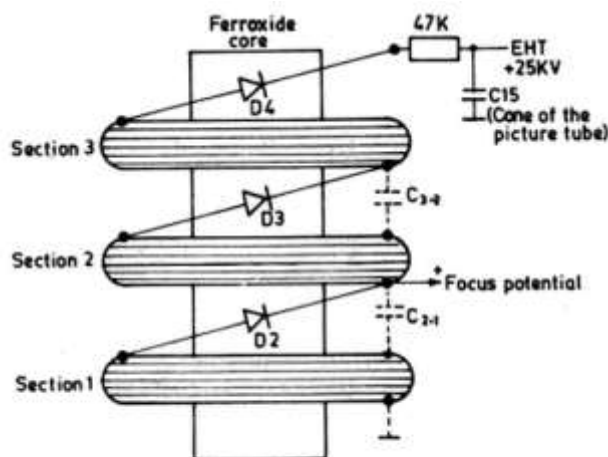
**Explanation:-**

03M

- Anode potential (G2) is obtained for screen grid separately at collector of Q2.
- This is rectified by D1 and then filtered by C10. Output DC voltage is 550 to 800 V. Any failure of G2 means no beam current and hence no spot is produced on screen.
- Focus anode (G3) potential needed is 6.5kV to 7.5kV. It is obtained from diode split winding (D2, D3 and D4). Each stage produces potential of 8kV.

**OR**

- In colour TV to generate EHT up to 25 KV the diode split addition technique is used. The principle of “DIODE-SPLIT ADDITION” is illustrated in figure below.



principle of split-diode addition to obtain EHT and focus anode potentials for a colour picture tube.

**Figure: Split Diode Technique**

- The three layers of secondary windings are shown wound round on the ferroxide core of the L.O.T. Each winding is identical to the other and has the same number of turns.
- The same magnitude of voltage will therefore be induced in each section every time the flyback derived input pulse get applied to the primary winding.

- Because of the close proximity of individual layers and interlayer capacitance exists between each of them. It is indicated in the diagram by dotted because this capacitor physically does not exist.
- If a diode is connected between the end of one layer of winding and the start of the next the AC voltages induced in each layer can be made to charge up all the inter-layer capacitances to the same voltage. Since capacitances are effectively in series, the total output voltage appearing at the output terminal is the sum of all the voltages appearing across all of them.
- The diode shown connected in series between the layers are physically embedded in the windings and form an integral part of the transformer. The three windings are so designed that voltage induced in each layer form the flyback transformer is 8.33KV. This makes the total potential equal to  $(8.33KV+8.33KV+8.33KV \approx 25 KV)$  and forms the EHT supply source.

b) Draw composite video signal of one line and label it showing.

i) DC level

ii) Blanking level

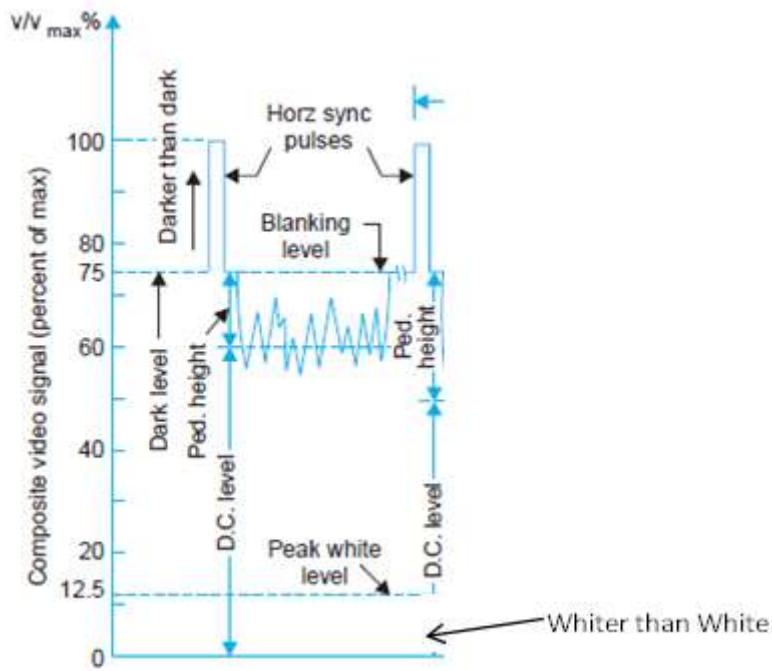
iii) Whiter than white level

iv) Pedestal height and explain it.

Ans:

Diagram:-

02M



DC level:

DC level corresponds to average brightness of the scene.

01M

Blanking level:

The sync pulses are added at 75% level called the blanking level.

01M



**Whiter than white level:**

01M

The lowest 10% of voltage range is not used to minimize noise effects which is known as whiter than white level.

**Pedestal height:**

01M

The pedestal height is the difference between the pedestal level and the average value (dc level) axis of the video signal.

**Q5 Attempt any two:**

16M

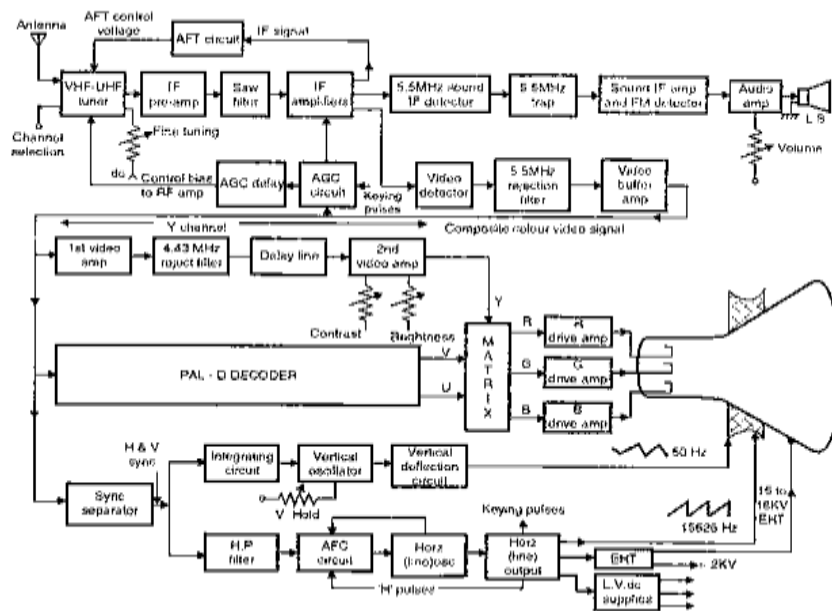
a) Draw the block diagram of colour TV receiver (PAL D type). Explain how signal is processed in each block

Ans:-

*(Note: Any other relevant Diagram can be considered.)*

**Diagram:-**

04M



**Explanation:-**

04M

- A colour TV receiver contains all the necessary circuits of a monochrome receiver plus additional circuits required for the reproduction of a colored picture. Basically a colour TV receiver is a black-and-white receiver with a decoder for the colour signals and a colour picture tube.
- The figure is the functional block diagram of a colour TV receiver. The block diagram shows that the circuits like the RF tuner, VIF amplifier, the video amplifier, the deflection sync, the sweep circuits and the EHT sections are virtually the same as in black-and-white receiver.
- However there are some minor differences in design and details. For example the RF response in case of colour TV is kept more uniform than in monochrome receiver; this is to avoid any attenuation of the colour sub-carrier.

- The tuning of a colour TV is critical. To avoid any mistuning of the receiver, an arrangement called AFT (Automatic Fine Tuning) is used in most cases. This arrangement is similar to the AFC and can be switched off whenever manual tuning is required. The colour TV uses the inter carrier sound system with one difference.
- The sound take-off point is at the last VIF stage immediately before the video detector. This is done to avoid interference between the sound IF and the Chroma signal. A separate diode detector is used to produce the sound IF but the rest of the audio circuits are the same as in a monochrome receiver.

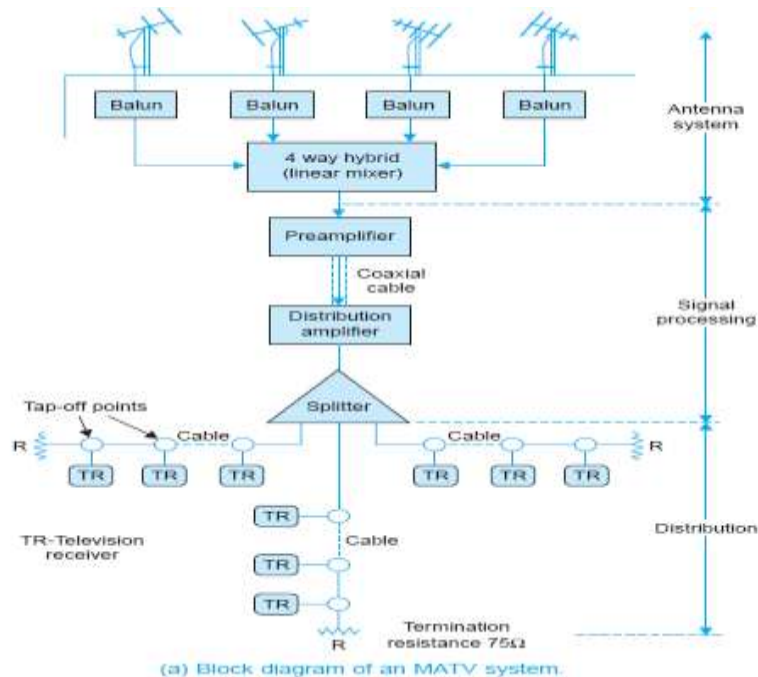
The two main circuits which **distinguish a colour TV from a monochrome TV** are the colour **picture tube and the Chroma section** containing the colour circuits.

b) Draw the layout diagram for MATV and explain it in detail.

Ans:-

Diagram:-

04M



Explanation:-

04M

MATV:-

- The block diagram of a basic MATV system is shown in Fig. One or more antennas are usually located on roof top, the number depending on an available telecasts and their direction.
- Each antenna is properly oriented so that all stations are received simultaneously. In order to allow a convenient match between the coaxial transmission line and components that make up the system, MATV systems are designed to have a 75 Ω impedance. Since most antennas have a 300 Ω impedance, a BALUN is used to convert the impedance to 75 ohms.
- As shown in the figure, antenna outputs feed into a 4-way hybrid. A hybrid is basically a signal combining linear mixer which provides suitable impedance matches to prevent development of standing waves.
- The standing waves, if present, result in ghosts appearing in an otherwise good TV picture. The output from the hybrid feeds into a distribution amplifier via a preamplifier.

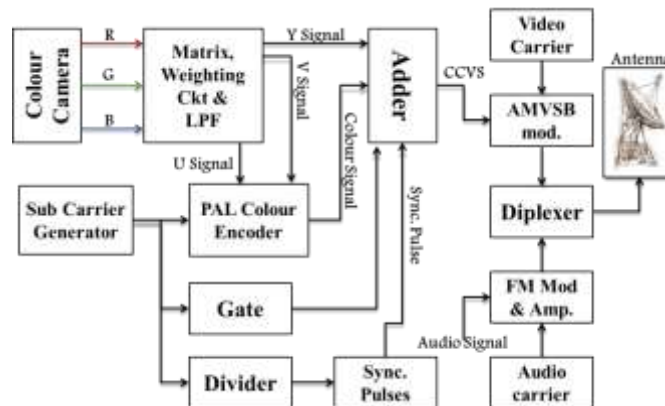
- The function of these amplifiers is to raise the signal amplitude to a level which is sufficient to overcome the losses of the distribution system while providing an acceptable signal to every receiver in the system.
- The output from the distribution amplifier is fed to splitters through coaxial lines.

c) Draw the block diagram of colour TV transmitter and explain the function of each block

Ans:-

Block diagram of Colour TV transmitter:

04M



Explanation:-

04M

A PAL colour TV transmitter consists of following three main sections.

1. Production of Luminance (Y) and Chrominance (U and V) signals
2. PAL encoder
3. Video and Audio modulators and transmitting antenna

Production of Luminance (Y) and Chrominance (U and V) signals:

- Colour camera tube produces R, G and B voltages pertaining to the intensity of red, green and blue colours respectively in pixels. The luminance signal Y is obtained by a resistive matrix, using grassman's law.  
 $Y=0.3R+0.59G+0.11B$ .
- For colour section Y is inverted colours R&B obtained from the colour camera tubes are added to it to get (R-Y) and (B-Y) colour difference signal. These signals are weighted by two resistive matrix network which gives U & V signals as  $U=0.493 (B-Y)$  &  $V=0.877(R-Y)$

PAL encoder:

- PAL switch which operates electronically at 7812.5Hz with the help of bistable multivibrator and feeds the sub-carrier to balanced modulator with phase difference of +90° on one line and -90° on the next line.
- The PAL encoder consists of a **sub carrier generator and two balanced modulator with filters to produce modulated subcarrier signal**. These signals are added vertically to give Chroma signal (C). Then Chroma signal is mixed with Y signal along with sync. And blanking pulses to produce Colour Composite Video Signal (CCVS).

Video and Audio modulators and transmitting antenna:

- CCVS amplitude modulates the main video carrier. It is followed by a sharp VSB filter to attenuate the LSB to give AMVSB signal for transmitter. Audio signal modulates separate carrier. This modulation is FM type.
- AMVSB video signal along with audio signal passes to the transmitting antenna through Diplexer Bridge which is a wheat-stone's bridge.

**Q6 Attempt any four:****16M****a) Define the terms:**

- Aspect ratio**
- Image continuity**
- Saturation**
- Hue**

**Ans:-****Aspect Ratio:****01M**

The **aspect ratio** of an image describes the proportional relationship between its width and its height. The frame adopted in all television systems is rectangular with width/height ratio, i.e., aspect ratio = 4/3.

**Aspect Ratio= Width of the Screen/Height Of the Screen=4/3**

**Image Continuity:****01M**

While televising picture elements of the frame by means of the scanning process, it is necessary to present the picture to the eye in such a way that an illusion of continuity is created and any motion in the scene appears on the picture tube screen as a smooth and continuous change.

**Hue:****01M**

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.

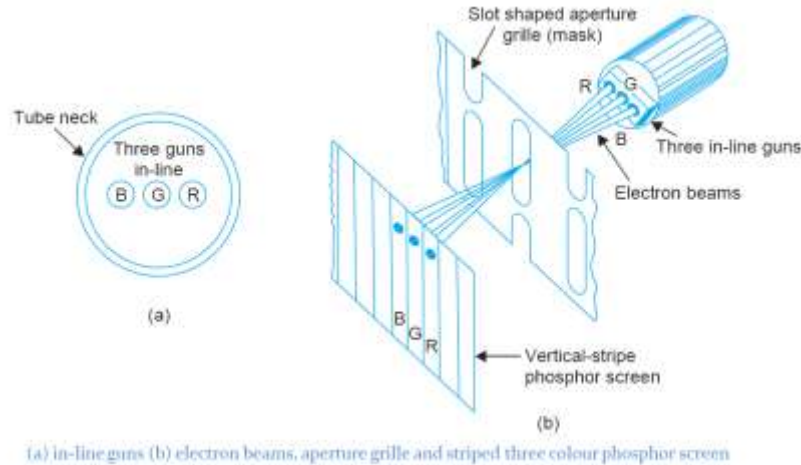
**Saturation:****01M**

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

**b) Explain PIL picture tube in detail.****Ans:-****Explanation:-****04M**

- This tube as the name suggests has three guns which are aligned precisely in a horizontal line. The gun and mask structure of the P.I.L. tube together with yoke mounting details are illustrated in Fig. The in-line gun configuration helps in simplifying convergence adjustments.

- As shown in the figure colour phosphors are deposited on the screen in the form of vertical strips in triads. (R, G, B) which are repeated along the breadth of the tube.
- To obtain the same colour fineness as in a delta-gun tube the horizontal spacing between the strips of the same colour in adjacent triads is made equal to that between the dots of the same colour in the delta-gun tube.



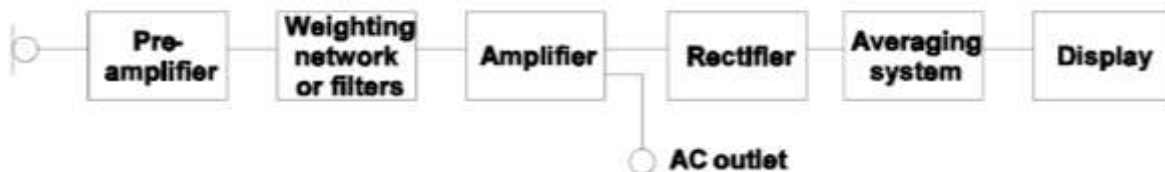
- As shown in Fig. (b), the aperture mask has vertical slots corresponding to colour phosphor stripes. One vertical line of slots is for one group of fine strips of red green and blue phosphors. Since all the three electron beams are on the same plane, the beam in the center (green) moves along the axis of the tube.
- However, because of inward tilt of the right and left guns the blue and red beams travel at an angle and meet the central beam at the aperture grill mask. The slots in the mask are so designed that each beam strikes its own phosphor and is prevented from landing on other colour phosphors.
- The P.I.L. tube is more efficient, i.e., has higher electron transparency and needs fewer convergence adjustments on account of the in-line gun structure. It is manufactured with minor variations under different trade names in several countries and is the most used tube in colour receivers.

c) Draw the block diagram of dB meter and explain its working principle.

Ans:-

Diagram:-

02M



Explanation:-

02 M

The two main characteristics are:

1. The frequency response: that is, the deviation between the measured value and the true value as a function of the frequency. As the ear is capable of hearing sounds between 20 Hz and 20 kHz, the frequency response of the sound level meter should be good, with variations smaller than 1 dB, over that range.

2. The dynamic range: that is, the range in dB over which the measured value is proportional to the true value, at a given frequency (usually 1000 Hz). This range is limited at low levels by the electrical background noise of the instrument and at high levels by the signal distortion caused by overloading the microphone or amplifiers.
- The electrical signal from the transducer is fed to the pre-amplifier of the sound level meter and, if needed, a weighted filter over a specified range of frequencies.
  - Further amplification prepares the signal either for output to other instruments such as a tape recorder or for rectification and direct reading on the meter.
  - The rectifier gives the RMS value of the signal. The RMS signal is then exponentially averaged using a time constant of 0.1 s ("FAST") or 1 s ("SLOW") and the result is displayed digitally or on an analog meter.
  - In some cases, the sound level meter does not include a logarithmic converter. The scale on the indicating device is then exponential so that the linear signal may be read in dB.
  - In this case, the dynamic range of the display is usually restricted to 10 to 16 dB and the precision of the reading is rather poor. In the case of intermittent noise, the user must constantly adjust the amplifier to adapt the output signal to the dynamic range of the display.
  - When a log converter is used, the display scale is linear in dB and its dynamic range is usually much greater. This type of display has the advantage of providing the same precision at any level and permitting a much better appreciation of the range of fluctuations of the noise to be measured. In this regard, digital displays are less useful.

OR

Principle:

02M

- The logarithmic term is applied to an electronic voltmeter when the current or voltage produced in the indicating instrument by an applied voltage is proportional to the logarithm of applied voltage.
- Such a characteristics leads to a linear decibel scale for the indicating instruments and finds many applications in electronics.
- The reading on the meter scale is calibrated in decibels and hence the instrument is called a dB voltmeter or simply dB meter.

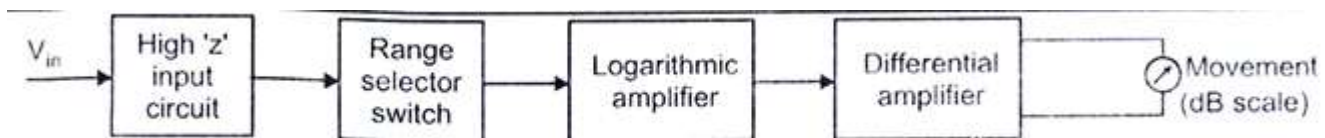


Figure: Block diagram of dB meter

Working:

- The RF signal to be measured is connected to the input of high impedance input circuit through a RF connector, whose input impedance is 75  $\Omega$ . The range selector switch selects the band and range of its frequencies to be tuned.
- The logarithmic amplifier is connected to the differential amplified whose signal output deflects the dB scale in the dB meter. To obtain logarithmic characteristics, the meter use a diode in feedback loop of an op-amp. dB is the unit for losses and gains.

d) List various control of Hi-Fi amplifier and explain any one

Ans:-

**Various control of Hi-Fi amplifier:-**

01M

- Balance Control:
- Master Gain Control:
- Blend Control:
- Quasi Stereo Switch:
- Bass & Treble Control:
- Loudness Control:

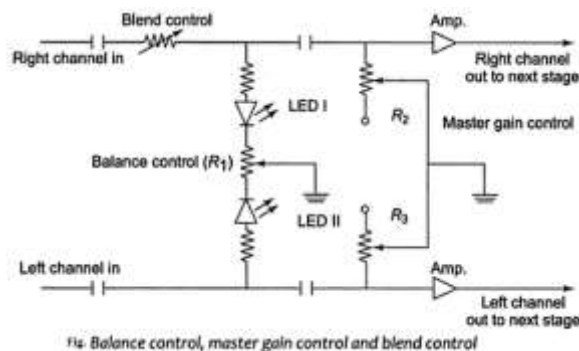
**Note:** Student will explain any 1 of below

**Explanation:-** (Any one)

03M

**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*.
- A simple circuit is shown in fig. The balance control is a potentiometer. When it is set in the center, the current through LED1 & LED2 should be identical, if the signals in the left & right channels are equal. In that case both LED will be equally bright.
- In case of any inequality, the two brightness level will also become unequal. When balance control is moved down, the output of the left channel will increase while that of right one will decrease, and vice-versa when moved up.



**Figure: Balance Control, master gain control & blend 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.
- A typical master gain control circuit is shown above. R1 is adjusted for balancing two channels & then R2 & R3 are adjusted for increasing or decreasing the volume of the channels. R2 & R3 are ganged.

**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.
- It is shown in fig. above; blend control potentiometer is set at zero resistance for balanced output. For disturbing the balance, this is advanced further to reduce gain of the left channel.
- Although blending can be done by balance control also, but once set, the balance control is not disturbed.

**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*.

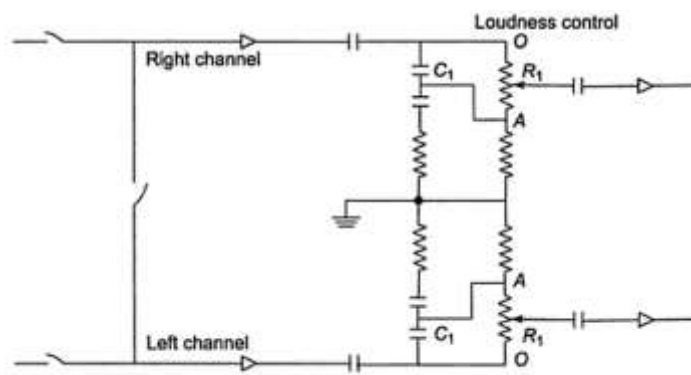


Fig. Loudness control

**Figure: Loudness control**

- It boost audio by +12dB at 50Hz & +3dB at 10 KHz. The loudness control should be used only when sound level is low.

e) State Grassman's law and explain additive colour mixing

Ans:-

**Grassman's law:**

02M

This property of the eye of producing a response which depends on the algebraic sum of the red, green and blue inputs is known as Grassman's Law.

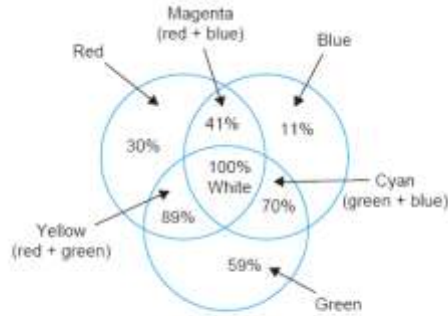
**Additive mixing:-**

02M





Additive mixing which forms the basis of colour television, light from two or more colours obtained either from independent sources or through filters can create a combined sensation of a different colour. Thus different colours are created by mixing pure colours and not by subtracting parts from white.



Additive colour mixing. The diagram shows the effect of projecting green, red and blue beams on a white screen in such a way that they overlap.