T.Y. Diploma : Sem. V
[EN/EX/EJ/DE/ED/EI]
Audio Video Engineering

Time: 3 Hrs.] Prelim Question Paper Solution **[Marks : 100**

Q.1(a) Attempt any THREE of the following : [12]

Q.1(a) (i) Compare woofer, mid-range, tweeter speaker (any four points). [4]

Ans.:

SR. NO.	PARAMETER	WOOFER	MID-RANGE (SQUAWKER)	TWEETER
1.	Definition	A woofer is a technical term for loudspeaker deriver designed to produce low frequency sounds	A mid-range speaker is a loudspeaker driver that reproduces sound in the frequency range from 250 to 2000 Hz	A tweeter or treble speaker is a special type of loudspeaker that is designed to produce high audio frequencies
2.	Range of Frequency	16Hz to 500Hz	500Hz to 5KHz	5KHz to 20KHz
3.	Size & Physical Structure	Size is largest to match the impedance to the air.	They are of medium size, kept in between tweeter & woofer.	They process High frequency, hence their size is small. They are light in weight so that they can respond rapidly to applied signal.
4.	Weight	Heavier than tweeter & Squeaker	Heavy than tweeter & light in weight than woofer	Light in weight than woofer & Squeaker

Q.1(a) (ii) Why dish antenna is having parabolic shape and meshy surface? List any four specifications of dish antenna. [4]

Ans.:

- While installing the dish antenna look angles are taken into consideration. Once look angel adjusted installation should not be disturbed Due to atmospheric changes like rain, wind there is a possibility of change in look angle of dish, Due to meshy structure, rain and wind will go through holes by keeping fix position of dish antenna.
- The parabola is a plane curve defined as the locus of point which moves so that its distance from another point (called the focus) plus its distance from a straight line (directrix) is constant. These geometric properties yield an excellent microwave or light reflector.

Specification of Dish Antenna:

- Size – 8 feet
- Gain – 36 dB or 42dBi/40.7dBi.
- Band–C–(3.7 to 4.2 GHz downlink frequency)
- Look angle – 360 degree rotation in azimuth 18 to 90 degree rotation in elevation.
- Offset angle – 24.62 limit
- Focal length – 90 cm.
- Elevation angle range = 17 to 90 limit
- Azimuth angle = 0 to 360 degree
- Aperture efficiency = 75%

- Diameter: 5m/3.7GHz
- Mount: Azimuth elevation type
- Drive: Motorized & manual
- Wind velocity: 100kmph

Q.1(a) (iii)Define : (1) Aspect ratio (2) Horizontal resolution [4]
(3) Hue (4) Saturation

Ans.: (1) Aspect ratio:

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

(2) Horizontal resolution:

The ability of the scanning system to resolve the picture details in the horizontal is known as horizontal resolution.

(3) Hue:

This is the predominant spectral colour of received light which means it is the actual colour 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.

Q.1(a) (iv)List different lenses used in CD mechanism. State the function of each. [4]

Ans.: Types of Lenses used in CD player

(i) Collimatiion Lens (ii) Concave Lens
(iii) Objective Lens (iv) Cylindrical Lens

(i) Collimatiion 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.

(ii) 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.

(iii) Objective Lens

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

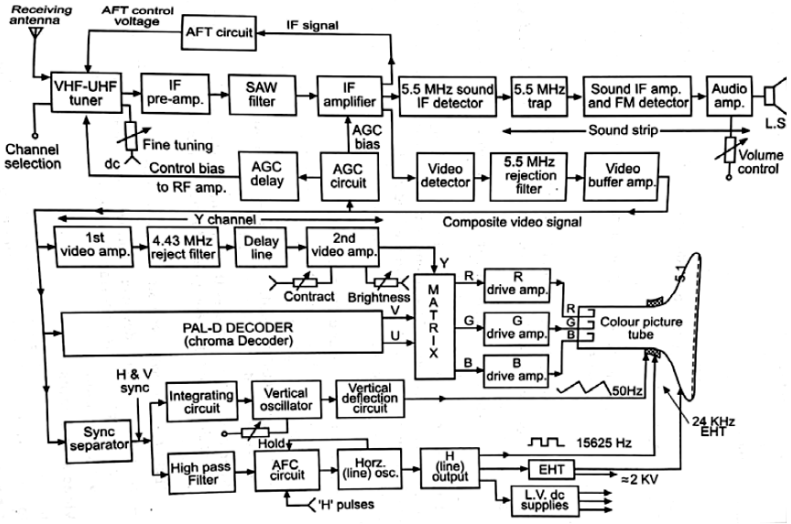
(iv) Cylindrical Lens (In Three-Beam Linear Optical Block)

The main function 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 of the disc is maintained.

Q.1(b) Attempt any ONE of the following : [6]

Q.1(b) (i) Draw the block diagram of Color TV Receiver (PAL-D) and label it. [6]

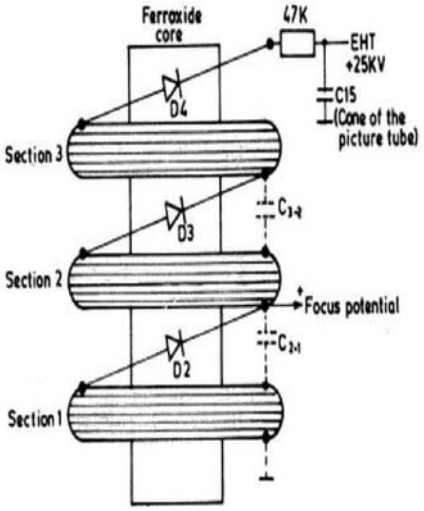
Ans.:



Q.1(b) (ii) Explain EHT generation in colour TV with circuit diagram. [6]

Ans.: EHT is a voltage generator, which generates around 17KV for B/W TV & 25 KV for colour TV using the principle of auto transformer action V = L di/dt

In colour TV to generate EHT up to 25 KV the diode split addition technique is used. The principle of "DIODESPLIT ADDITION" is illustrated in figure below.



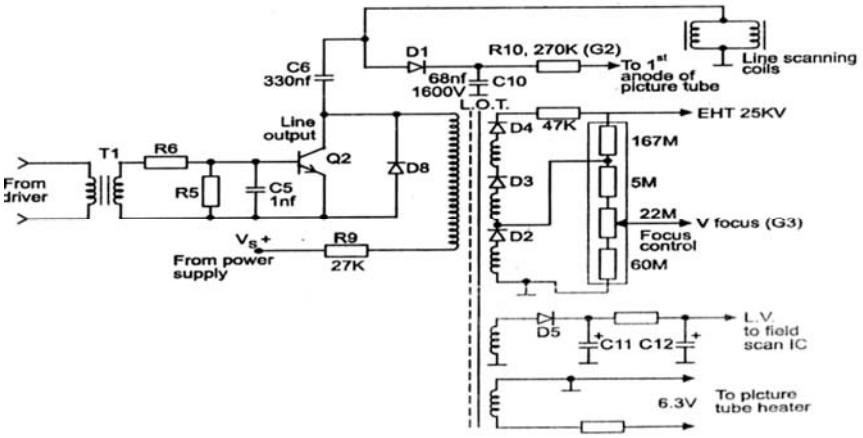
principle of split-diode addition to obtain EHT and focus anode potentials for a colour picture tube.

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 interlter capacitance exists betwwen 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 the voltages appearing across all of them. The diode shown connected in series between the layer 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 fly back transformer is 8.33KV. This makes the total potential equal to (8.33KV + 8.33KV + 8.33KV ≈ 25KV) and forms the EHT supply source.

OR

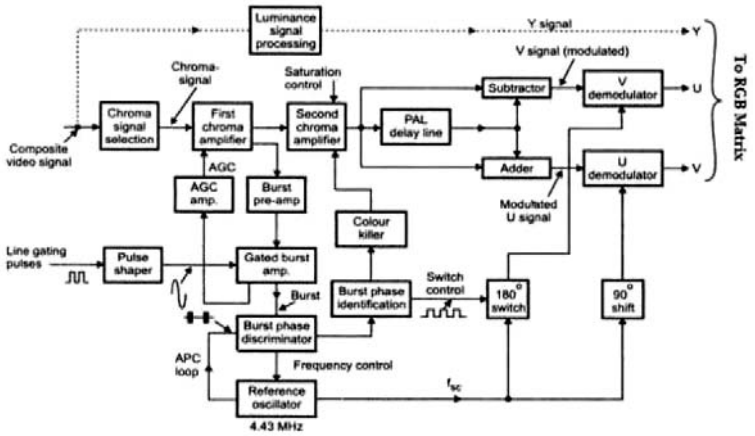


Anode potential (G2) is obtained for screen grid separately at collector of Q2
This is rectified by D1 and then filtered by C10. Output DC voltage is 550 to 800 V. Any failure of G2 means no beam current and hence no spot is produced on screen.
Focus anode (G3) potential needed is 6.5kV. It is obtrained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

Q.2Attempt any FOUR of the following : [16]

Q.2(a) Draw the block diagram of PAL-D decoder system. [4]

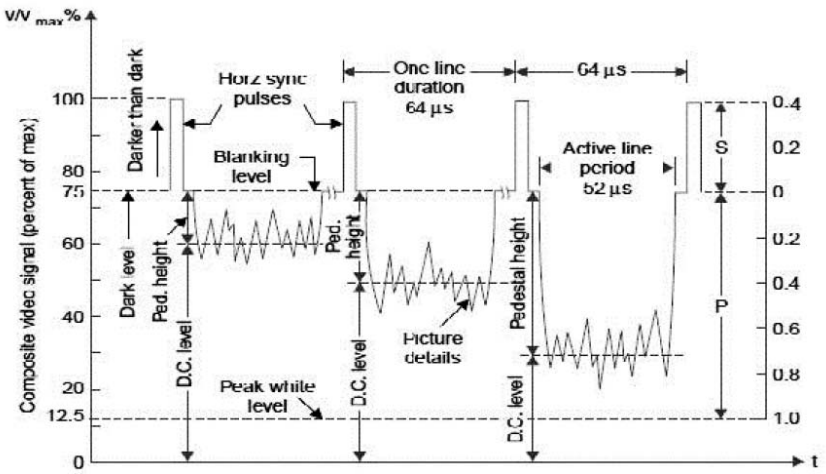
Ans.:



Block diagram of PAL-D decoder

Q.2(b) Draw neat labeled sketch of composite video signal. [4]

Ans.: Diagram:

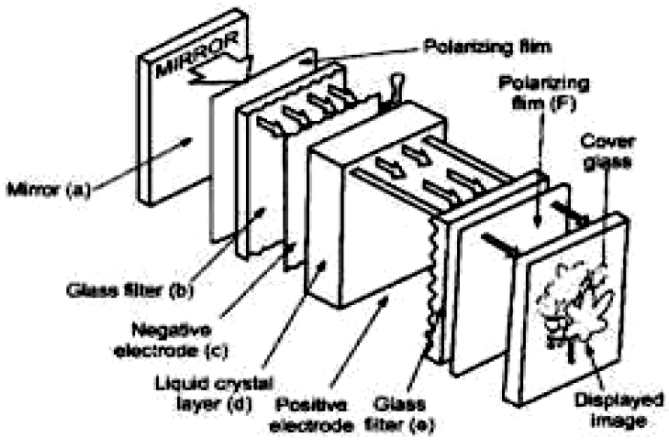


Q.2(c) Explain working principle of LCD TV **[4]**

Ans.: Working:

- 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:



Q.2(d) List advantages of Vaccum florescent. **[4]**

Ans.:

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

Q.2(e) Describe NHK and MUSE system for HDTV. **[4]**

Ans.: Description:

- 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 abut 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.

Q.2(f) State necessity of crossover network. Draw and explain three way crossover network. [4]

Ans.: Necessity of Cross over Network:

A single cone type speaker is not able to provide uniform response and adequate output power over the entire AF range.

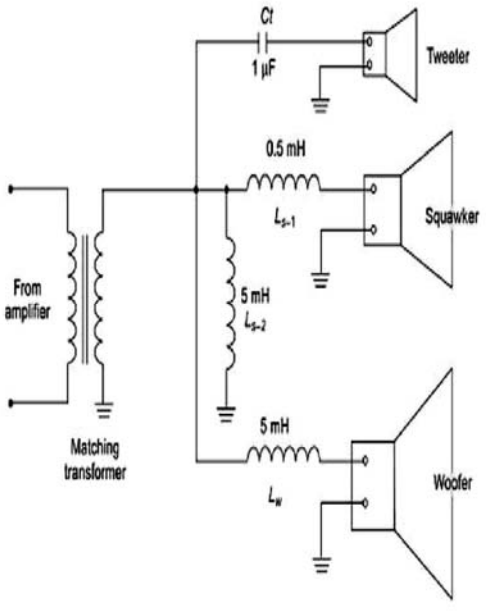
A loudspeaker mechanism with a heavy and large diameter called woofer can reproduce low frequencies. A loudspeaker with a light and small diameter cone known as tweeter which performs much better at the high frequency audio frequency range. For proper functioning of a dual speaker system, it is necessary that the frequency range to be covered by the combination of speakers should be split into two ranges at a frequency called cross-over frequency. Hence woofers & tweeters are used with cross-over networks, for getting a uniform frequency over the entire frequency range.

Distribution Frequency
Woofer: 16Hz-500 Hz
Squawker: 500 Hz-5000 Hz
Tweeter: 5000-20000 Hz.

Three way crossover network

In three way cross-over network shown in the fig. indicator L of 5mH in series with woofer prevents high frequencies from reaching the woofer. Similarly, capacitor of 1μF in series with tweeter avoids low and mid frequencies from reaching the squawker.

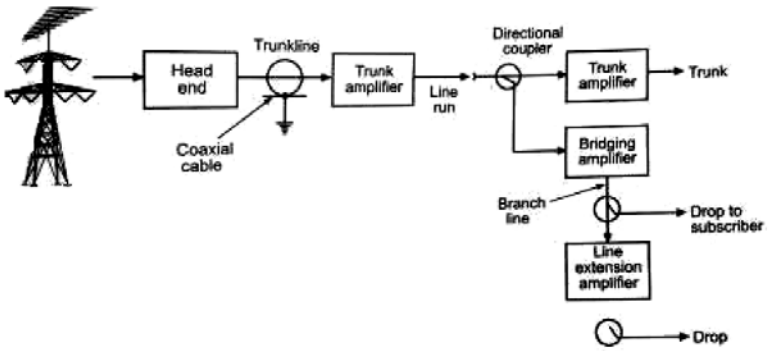
The response curve for three way cross-over network is shown in fig. Single filtering element (used in woofer and tweeter) gives attenuation of 6dB per octave and double element (used in woofer and tweeter) gives attenuation of 6dB per octave and double element (used in squawker) gives attenuation of 12dB per octave.



Q.3 Attempt any FOUR of the following : [16]

Q.3(a) Describe the architecture of cable TV network. [4]

Ans.:



Types of amplifiers used in cable TV distribution are

1. Trunk amplifier 2. Bridging amplifier 3. Line Amplifier

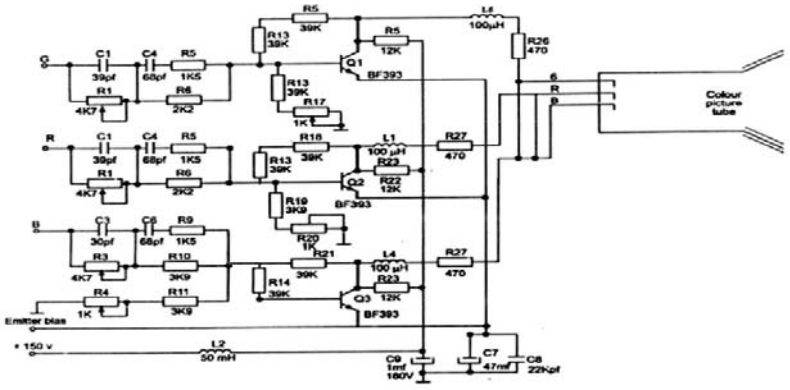
1. **Trunk amplifier :**
   There are losses in cable: DC loss, Skin effect loss and dialectic loss. These losses increase in proportion to Square root of frequency at the high VHF, the loss may be double of loss at low VHF Hence the trunk amplifiers (Gain =20db to 30db) are inserted at regular intervals along the trunk route to make up for cable losses.

2. **Bridging amplifier :**
   A bridging amplifier is for a branch from the main trunk to feed a particular neighborhood in the cable system. There is a bridge amplifier to act as a bridge between the trunk line and the branch line it takes care of impedance mismatch caused by the connection with the trunk line and compensates the loss in the trunk line up to the point of connection. Gain of amplifier is 20 to 30 db.

3. **Line Amplifier :**
   Branch lines are shorter in length, but they also need amplifier of 20 db to 30 db gain at suitable intervals when a branch line is extended an amplifier becomes necessary and hence, it is also called as line extender.

Q.3(b) Draw the circuit diagram of RGB drive amplifier and describe its operation. [4]

Ans.: Diagram:



Explanation:

- 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 configuraion. 150 V dc supply is filtered by L_2 and C_9, C_7 and C_8 are bypass to the emitter supply.
- R_{21} and R_{14} provide negative feedback to improve dc stability. L_4 in the collector load used to extend bandwidth. C_3 at input to amplifier is to improve step response.

- The D.C. collector voltage determines the picture tube cut-off voltage is fixed by R_{11} & R_4 is varied for monochrome reproduction at high lights.
- 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. Q_1, Q_2, Q_3 are high frequency transistor of type BF_{393} of BF_{869}.

Q.3(c) Describe operation of Dolby A system of noise reduction. [4]

Ans.: Explanation: Dolby A was the company's first noise reduction system, presented in 1966. It was intended for use in professional recording studios, where it became commonplace, gaining wide spread acceptance at the same time that multi track recording became standard. The input signal is split into frequency bands by four filters with 12 dB per octave slopes, with cutoff frequencies (3 dB down points) as follows:

- Low-pass at 80Hz; (Improvement in SNR with respect to hum & rumble.)
- Band-pass from 80 Hz to 3 kHz; (Deals with mid band noise.)
- A high-pass from 3 kHz; (Improvement in SNR with respect to hiss & modulation noise.)
- High-pass at 9 kHz. (Improvement in SNR with respect to hiss & modulation noise.)
- The output of four separate units is added. All this is done in side branch, and this branch is known as differential network. The output of differential network goes to the main branch as shown in fig. the output of adder is the Dolby processed signal.
- In playback, the differential network separates out the boosted signals in the side branch & subtracts from the input signal as shown in fig.

Block Diagram:

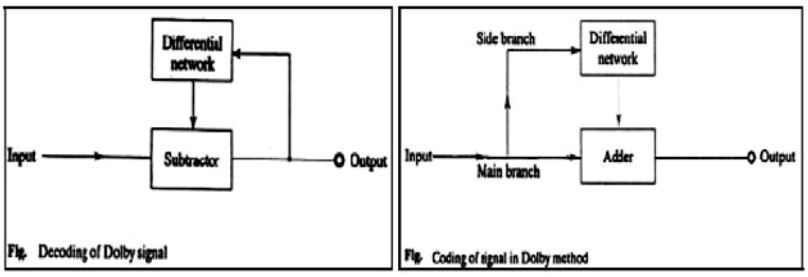


Figure: Dolby A method

Note: SNR Graph optional

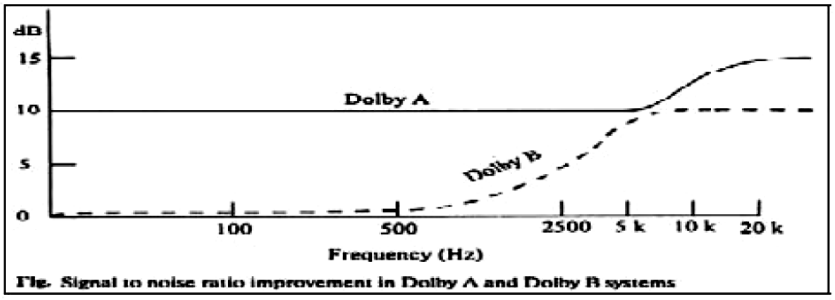
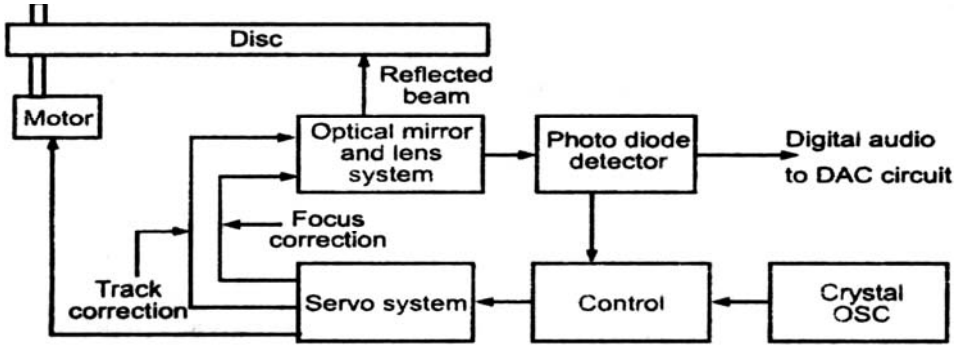


Fig. Signal to noise ratio improvement in Dolby A and Dolby B systems

Q.3(d) Explain CD detection technique used in CD player with a neat sketch. [4]

Ans.:



Explanation:
The signal on the disc surface is processed and reproduced within the CD player. During detection (i.e. decoding), the digital data on the disc surface is read by decoding surface and is converted into the analog audio signal required to derive the speaker and to regenerate the stored music.

Control signals allow any combination of tracks to be played in any sequence with the help of a keyboard. Also the display of next is provided to monitor the music being played. Clock signal is obtained from the disc itself. It is compared with a crystal oscillator signal. Any discrepancy results in generation of correction signal which is applied to the servo system. As it is a very high fidelity system, it is incorporated stereo sound. Stereo signals are multiplexed before modulation of the laser beam. After detection, these signals are demultiplexed to give to separate channels of stereo systems. Scanning of the tracks by laser beam is done from the center proceeding towards the edge. For this purpose the disc is rotated and the laser is moved from the center to the edge.

Scanning speed is about 1.2 m/s. Total track length is 6km. This gives playing time of 60 mins plus about 20 min time for error correction. Frequency response of a compact disc is from 20 Hz to 20 KHz. During decoding, the digital data on the disc surface is read by the decoding circuit and is converted into the analog audio signals required to drive the speaker and to regenerate the stored music.

Q.3(e) List TV channel allocation for band I and band III. [4]

Ans.:

Band	Channel No.	Frequency range
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

Q.4(a) Attempt any THREE of the following : [12]

Q.4(a) (i) Explain/Define the following terms related to TV : [4]

(1) Hue (2) Luminance

(3) Bandwidth for color signal (4) Saturation

Ans.: (1) Hue: This is the predominant spectral color of received light which means it is the actual color seen by the eye. Red, Green, Blue, Yellow, Magenta, represent different in the visible spectrum.

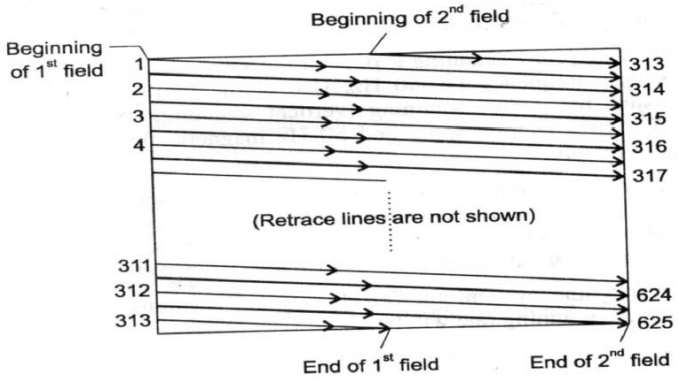
(2) Luminance: Luminance is the amount of light intensity or the total amount of light energy that is received by the eye irrespective of the color of light. In monochrome TV, better lighted parts have more luminance than dark areas and different colors have shades of luminance.

(3) Bandwidth of color signal: The color sub carrier frequency is restricted to about ± 1.2 MHz around the sub carrier. The brightness signal is transmitted with full frequency bandwidth of 5 MHz for maximum horizontal details in mono chrome.

(4) Saturation: It represents the spectral purity of a color light. It is the amount of white light that is mixed with a color.
A fully saturated color will have no white light mixed with it.
For example, a Pure Red without White is a saturated color.

Q.4(a) (ii) Describe interlace scanning in brief. How interlace scanning help to reduce bandwith of video signal? [4]

Ans.: Diagram:



Explanation:

- To reduce flicker, an effective rate of 50 vertical scans per second is utilize 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.
- 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.
- It reduces flicker, which results in reduction of bandwidth and noise.
- 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 313th lines and all even number of lines are scanned. This is called as even field. The scanning sequence is 2, 4, 6…
- 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.
- This method reduces flicker.

Q.4(a) (iii) Define positive and negative modulation. State any 2 merits and 2 demerits of negative modulation. [4]

Ans.: Positive modulation: When increase in brightness of the picture results in an increase in amplitude of modulated envelop it is called Positive Modulation.

Negative Modulation: When polarity of modulating video signal is so chosen that sync. Tips lies at the 100% level of carrier amplitude and increasing brightness reduces amplitude of the modulated envelope, it is called negative modulation.

Merits of Negative Modulation:

- 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:

- 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.

Q.4(a) (iv) Compare CATV and CCTV (any four points). [4]

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.

Q.4(b) Attempt any ONE of the following : [6]

Q.4(b) (i) Compare NTSC, PAL and SECAM system (any six points). [6]

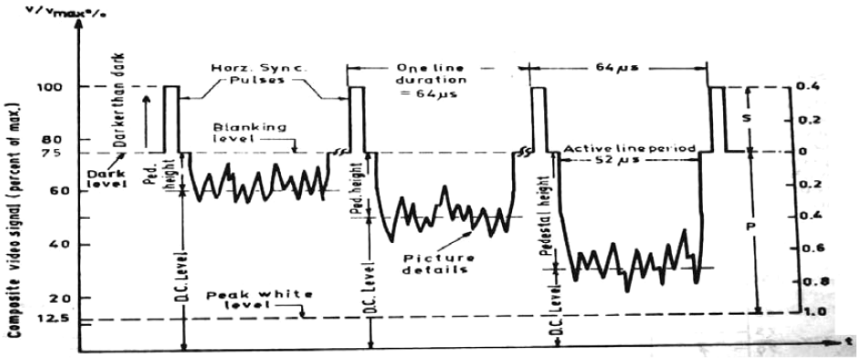
Ans.:

Sr. No.	Parameter	PAL	NTSC	SECAM
1.	Full form of system	Phase Alternation of Line	National Television System Committee	Sequential Colour A Memory
2.	Inventing country	Germany in 1967	USA in 1957	France in 1970
3.	Countries where used.	Germany, India, UK	USA, Canada, Japan, Mexico	France, East Europe, Africa
4.	Transmission of colour	By colour difference signals	By colour difference signals	By colour difference signals

5.	Video bandwidth	5 MHz	4 MHz	6 MHz
6.	Noise	High	High	Very high
7.	Identification signal	Needed	Not needed	Needed
8.	Cost	Costliest	Less than PAL but higher than SECAM	Cheapest

Q.4(b) (ii) Draw the composite video signal, label each section and define pedestal height and colour burst. **[6]**

Ans.:



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

Colour Burst: The sub carrier is suppressed at the modulated signal, it is necessary to generate it in the receiver for demodulation of colour signal .this signal generated must be of exactly same frequency and phase as that of the transmitted.

To ensure this,short wave of 8 to 10 pulse called the colour burst is sent to the receiver along with sync signals

Q.5 Attempt any TWO of the following : **[16]**

Q.5(a) Describe the construction and working of PIL picture tube. **[8]**

Ans.: Explanation:

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.

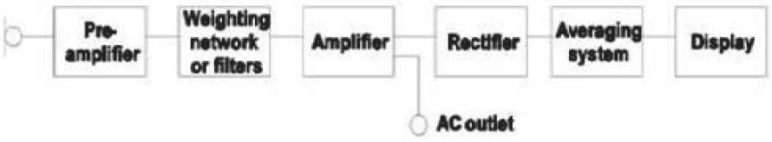
As shown in the aperture mask has vertical slots corresponding to colour phosphor stripes. One vertical line of slots is for one group of fine strips of red green and blue phosphors. Since all the three electron beams are on the same plane, the beam in the center (green) moves along the axis of the tube.

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.

Q.5(b) Draw and describe the working of dB meter. [8]

Ans.:



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 variationis smaller than 1 dB, over that range.

2. The dynamic range: That is, the ranfe 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.
   - 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

- 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.

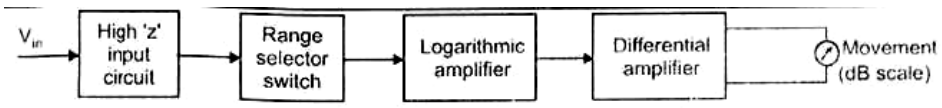


Figure: Block diagram of dB meter

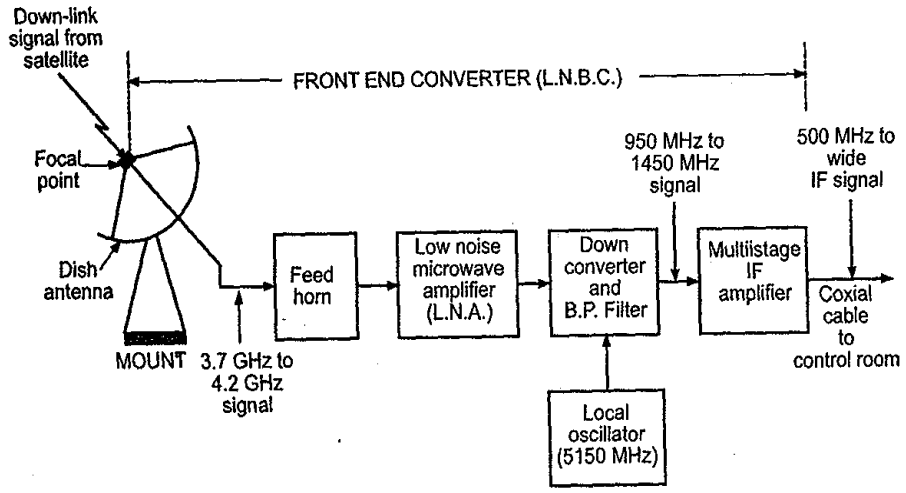
Working:

- 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 Ω. 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.

Q.5(c) Draw and describe block diagram of LNBC. List its any two applications. [8]

Ans.:



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 Convertor (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 950-1450MHz. 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.

Applications of LNBC: (Any Two)

1. It is the device on the front of a satellite dish that receives the very low level microwave signal from the satellite, amplifies it, changes the signals to a lower frequency band and sends them down the cable to the indoor receiver.
2. This down conversion allows the signal to be carried to the indoor satellite TV receiver using relatively cheap coaxial cable; if the signal remained at its original microwave frequency it would require an expensive and impractical waveguide line.

Q.6 Attempt any FOUR of the following : [16]

Q.6(a) State principle and explain working of plumbicon camera tube. [4]

Ans.:

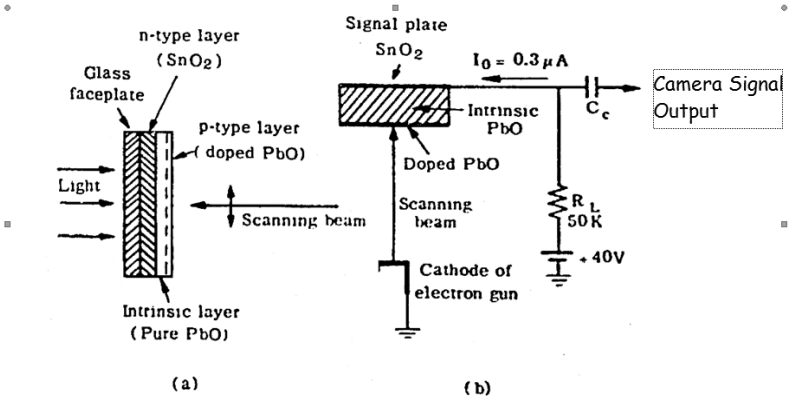


Fig. 1 : Plumbicon camera (a) target details (b) Output signal current

Principle: Plumbicon camera tube works on the principle of photo conductivity, where the resistanc of target material shows a mark decrease when exposed to light.

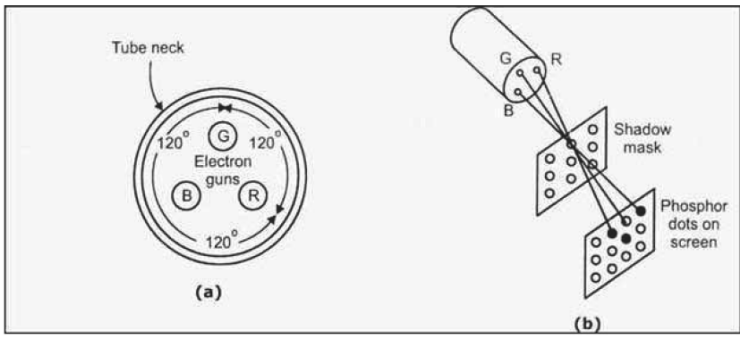
Working: In the plumbicon, each element serves as a capacitor in series with a reverse bias light controlled diode.

In the signal circuit, the conductive file of PIN oxide is connected to the target supply of 40V through an external load resistance R_1 to develop the camera output signal voltage. Light from the scene being televised is focused through the transparent layer of TIN oxide on the photo conductive lead monoxide.

Without light the target prevents any conduction. Because of absence of charge carries there is no output current. The incidence of light on the target results in photo excitation of a semiconductor junction between PbO and dopped layer. The resultant decrease in resistance causes flow of signal current which is proportional to the incident light of each photo element.

Q.6(b) Draw delta gun picture tube. **[4]**

Ans.:



Q.6(c) Compare MATV, CATV and CCTV (any 8 points). **[4]**

Ans.:

CATV	CCTV	MATV
CATV stands for Cable Television	CCTV stands for Closed Circuit Television	MATV stands for Master Antenna Television
Used in large complexes for broadcast purposes	Used for surveillance and distance education, Military installation	Used in firing areas where signal is weak
Local studio signals can be added	Visible to limited number of viewers	All signals are added in hybrid network and fed to subscriber
Distribution system can provide connections and facility to a large number of subscribers	Picture is not broadcaste	Subscribers are limited, if subscriber increase number of antenna has to increase
Two way cable system can be provided	Live or prerecorded signal are sent over a closed loop to finite number of recievers	Two way cable system are not used weak signal cannot be received so antenna is installed at the top and signal is processed through head end and distribution network and fed to subscriber.
Audio section is present	Audio section is not present.	Audio section is not present.
Internet services can be provided	Internet service cannot be provided.	Internet service cannot be provided.
Complex circuitry	Simple circuitry	Complex circuitry

Q.6(d) Describe the functions of following in Hi-Fi amplifier : [4]

(i) Balance control (ii) Loudness control

(iii) Bass and treble control (iv) Quasi stable control

Ans.: (i) 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.

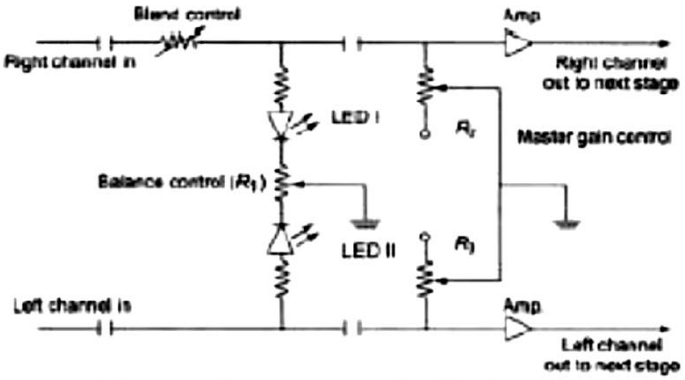


Fig. Balance control, master gain control and blend control

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

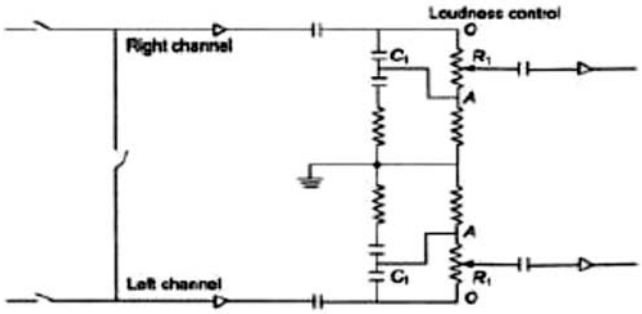


Fig. Loudness control

(iii) Bass & Treble Control:

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

(iv) 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.

Q.6(e) Describe vertical resolution and horizontal resolution in brief. [4]

Ans.: The scanning and reproduction of finest details of the picture is known as the resolution of a system.

Vertical resolution:

The ability of a scanning system to resolve vertical details in a scene depends upon the number of horizontal scanning lines used per frame.

The maximum number of dark and white elements which can be resolved by human ye in vertical direction in a screen of height H is decided by number of horizontal lines into which the picture is split while scanning.

The vertical resolution = 0.7*585 = 409.5 lines

Horizontal resolution:

It is the ability of scanning system to resolve horizontal details i.e. changes in brightness levels of elements along a horizontal scanning line.

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