FIRST TERM EXAMINATION [FEB.–2016]
EIGHTH SEMESTER [B.TECH]
CONSUMER ELECTRONICS [ETEC–408]

Time : 1½ hrs. **M.M. : 30**

Note: *Q. no. 1 is compulsory. Attempt any two more questions from the rest.*

Q.1.(*a*) What do you mean by persistence of vision? **(3)**

Ans. According to the theory of persistence of vision, the perceptual processes of the brain or the retina of the human eye retains an image for a brief moment of time. This theory is said to account for the illusion of motion which results when a series of film images are displayed in quick succession, rather than the perception of the individual frames in the series.

Persistence of vision should be compared with the related phenomena of beta movement and phi movement. A critical part of understanding these visual perception phenomena is that the eye is not a video camera: there is no "frame rate" or "scan rate" in the eye: instead, the eye/brain system has a combination of motion detectors, detail detectors and pattern detectors, the outputs of all of which are combined to create the visual experience. The frequency at which flicker becomes invisible is called the flicker fusion threshold, and is dependent on the level of illumination.

Q.1.(*b*) What are woofers and Tweeters? **(3)**

Ans. The main difference between woofers and tweeters is that the woofers are a lot larger than the tweeters. A good woofer might be 12 inches in diameter or more. There are a couple of reasons for that. First of all, the speaker has to move slower and the diaphragm (the speaker cone) has to move farther to create the sound wave. Secondly, the speaker must produce a higher volume of sound, as low frequency sound waves don't travel as well as high frequency ones do and are much more likely to dissipate and be absorbed by surfaces they come into contact with.

The speaker enclosure and the woofer interact with each other; so the speaker enclosure is usually designed specifically to match the woofer. There are several types of designs, but the two basic categories are a sealed enclosure and a ported enclosure. Sealed enclosures try to trap the sound coming off the back side of the speaker, providing the cleanest, crispest bass sound. However, the sound volume is lower.

Ported speakers are designed to allow that sound to escape, adding to the volume. However, the sound coming off the back of the speaker is 180 degrees out of phase with that coming off the front of the speaker. That can cause the sound waves to cancel each other out. However, the extra distance that the sound waves coming off the back of the speaker have to travel prevents that. Instead, the sound becomes less distinct and "muddy" due to the phase shift between the two sets of sound waves.

Tuned ports are used on some speaker enclosures. These ports are created to a specific size, so that they will cause the sound to reach the area in front of the speaker exactly one cycle later than the sound coming off the front of the speaker. While this still creates distortion, it is less than that caused by an unturned port.

Tweeters do not interact with their cabinets at all, and at times are used without a cabinet. While the construction is similar to a standard electromagnetic speaker, they usually use a dome-shaped diaphragm in place of a speaker cone. These are referred to as "dome tweeters." This diaphragm can either be made of plastic, plastic impregnated silk, aluminum or titanium. Each material type produces its own unique sound characteristics.

Since tweeters are extremely small, they don't produce a lot of volume. To help this, many are attached to a horn. This horn resonates or vibrates with the tweeter, mechanically amplifying the sound that it produces, in much the same way that a trumpet or other brass instrument amplifies the buzzing of the musician's lips.

Q.1. (c) Why picture signal is Amplitude Modulated and sound system is Frequency Modulated in TV Transmission? (4)

Ans. FM modulation occupies a bandwith that is several times the highest frequency to be demodulated, and video has such high frequencies, this is way too much BW for terrestial use. Satellite video is FM modulated, and the transponder BW is on the order of 30 MHz.

The main element to prevent interference to the video is the FM carrier level is only 5 to 10 percent of the video carrier, even less in Cable systems where 1 to 2 percent is common. The FM uses filters to keep the video from being demodulated as sound. However when highly saturated yellow color is overmodulated, it encrouches on the audio and is heard as a raspy buzz. The Video luminence is a 4.2 MHz signal, that is why the audio subcarrier is at 4.5 MHz. If the carrier were to be AM modulated, that would occupy a bandwidth of 8.4 MHz. With TV channels allocated on 6 MHz spacing, this would not fit. So the lower sideband is mostly eliminated leaving just 1.5 MHz as a vestige. This gives an occupied BW of 5.7 MHz for the video which does fit. As long as there's a carrier, diode detectors don't need both sidebands. When color was added, it's subcarrier at 3.57 MHz was done in such a way as to interleave with the visual, so it does not add to the overall BW.

FM was the choice for audio mostly because its greater RF BW makes it more immune to noise on demodulation. Random noise in the picture was not considered to be as serious a problem as the eye could 'average out' the sparkles.

Q.2. Explain the principle, Construction, working, features and application of a condenser (or capacitor) microphone. (10)

Ans. Condenser means capacitor, an electronic component which stores energy in the form of an electrostatic field. The term condenser is actually obsolete but has stuck as the name for this type of microphone, which uses a capacitor to convert acoustical energy into electrical energy.

Condenser microphones require power from a battery or external source. The resulting audio signal is stronger signal than that from a dynamic. Condensers also tend to be more sensitive and responsive than dynamics, making them well-suited to capturing subtle nuances in a sound. They are not ideal for high-volume work, as their sensitivity makes them prone to distort.

How Condenser Microphones Work

A capacitor has two plates with a voltage between them. In the condenser mic, one of these plates is made of very light material and acts as the diaphragm. The diaphragm vibrates when struck by sound waves, changing the distance between the two plates and therefore changing the capacitance. Specifically, when the plates are closer together, capacitance increases and a charge current occurs. When the plates are further apart, capacitance decreases and a discharge current occurs.

Electrical characteristics:

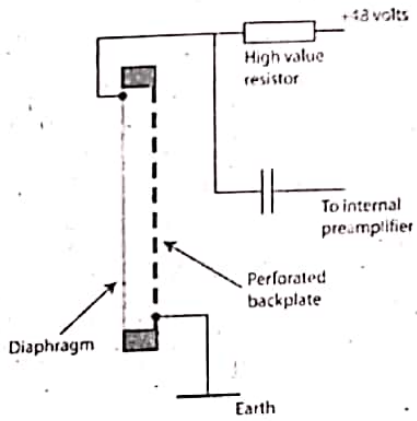
The diaphragm of the microphone forms one of the plates of a capacitor. The other plate is the backplate, which is close to and parallel to the diaphragm.

In any capacitor, $Q = C \times V$ - more appropriately represented here as $V = Q/C$

Q represents electrical charge. When a capacitor is charged, there is an imbalance between the quantity of electrons on one plate compared to the other.

C represents capacitance, which is the ability of the capacitor to store charge.

V is voltage.



Because $V = Q/C$, a capacitor with a low value of capacitance will measure a greater voltage across the plates than a capacitor with a high capacitance, for the same value of charge. The diaphragm and backplate of the microphone are charged up to a voltage of 48 V (typically). This is done through a high-value resistor so the audio signal is not affected.

The capacitance of any capacitor is governed in part by the separation between the plates. The closer the plates, the higher the capacitance.

Because $V = Q/C$, if the capacitance changes, then the voltage changes inversely in proportion.

Since one of the plates of the capacitor in the capacitor microphone is the diaphragm, which moves in response to sound, then as the separation between the plates changes in response to that sound, the capacitance changes and so does the voltage across the plates.

The AC component of this changing voltage is the signal produced by the microphone in response to sound.

Further points:

The capacitor microphone can only produce a very weak current from the diaphragm (i.e. it is high impedance). Therefore a capacitor microphone must have an internal amplifier close to the diaphragm.

Capacitor microphones require electricity to charge the diaphragm and backplate, and to power the internal amplifier.

An electret capacitor microphone employs a backplate that is permanently charged, hence there is no requirement for a source of electricity to charge the diaphragm. However, there is still an internal amplifier that requires power. This can be an internal battery.

Q.3. Describe construction and working of Mono chrome Picture Tube? How the picture formation takes place? (10)

Ans. Monochrome picture tube: The picture tube is a special form of cathode ray tube, the face plate of which serves as a screen of the television receiver. The various parts of a monochrome picture tube are shown in Fig. The cathode ray tube (CRT) is housed in a bell-shaped glass enclosure. A filament heats a cathode that emits electrons. The negatively charged electrons are attracted and accelerated by positive-bias voltages

on the elements in an electron gun assembly. The electron gun also focuses the electrons into narrow beam.

A control grid that is made negative with respect to the cathode, controls the intensity of the electron beam and brightness of the spot it makes. The beam is accelerated towards the screen by a very high voltage applied to an internal metallic coating called aquadag. The face or front of the picture tube is coated internally with a phosphor, that glows and produces white light, when it is struck by the electron beam.

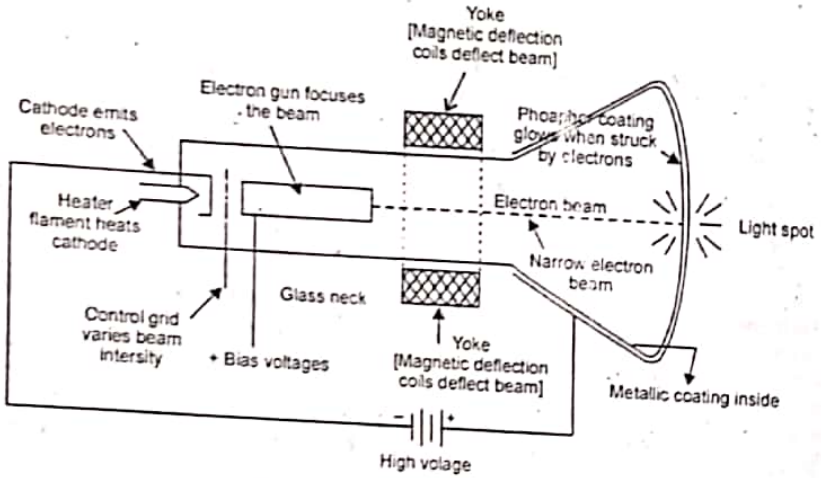


Fig. Monochrome picture tube

Around the neck of the picture tube is a structure of magnetic coils called the deflecting yoke. The horizontal and vertical current linear saw tooth waves generated by the sweep and synchronising circuits are applied to the yoke coils. This produces the magnetic field inside the tube that influence the position of the electron beam. When the electrons flow, a magnetic field is produced around the conductor through which the current flows. In a CRT, the electron beam is moved or deflected by the magnetic field produced by the deflection coils in the yoke. Thus the electron beam is swept across the face of the picture tube.

As the beam is being swept across the face of the tube to trace out the scene, the intensity of the electron beam is varied by the luminance or Y signal. The Y signal is applied to the cathode or in some cases to the control grid. The control grid is an element in the electron gun, that is negatively biased with respect to the cathode. By varying the grid voltage, the beam can be made weaker or stronger, thereby varying the intensity of the light spot produced by the beam, when it strikes the phosphor. Any shade of grey from white to black can be reproduced.

Q.4. Explain the concept of Positive modulation and Negative Modulation in VSB Transmission. Why in TV transmission Negative Modulation is preferred over Positive Modulation? **(10)**

Ans. Positive and Negative Modulation: We use AM for video signal. Generally, the amplitude of the carrier increases with increase in amplitude of the signal and vice versa. This is called "positive modulation". AM is effected by noise. Generally noise, when occurs tends to increases the amplitude of modulated signal. This increase causes bright blobs (spots) on the screen, when ever noise occurs. To over come this, negative modulation is followed.

In negative modulation, the instantaneous amplitude of the carrier decreases with increase in instantaneous amplitude of the signal. The resulting modulated wave has white level at lower side, black levels at higher level. So, whenever, noise occurs, due to increase in amplitude, the level goes towards less brightness level i.e., gray or black. Thus, the effect of noise is minimized.

In addition to reduced effect of noise in negative modulation, there are many other advantages.

Advantages of negative modulation over positive modulation:

(*a*) RF noise pulses will not cause adverse effect on picture.

(*b*) Greater peak transmitter power can be possible.

(*c*) AGC circuit will have stable level as reference.

Thus, negative modulation is preferred in TV broadcasting. Output frame camera tube (video signal) when it reaches the modulator, the polarity reversal is done so that black level is at 72.5 % and white level is at 12.5%. Thus, negative modulation takes place. However, strong noise pulses may cause false triggering of deflection oscillator being mistaken as sync pulses.

VESTIGIAL SIDE BAND TRANSMISSION

Another feature of present day TV Transmitters is vestigial side band transmission. If normal amplitude modulation technique is used for picture transmission, the minimum transmission channel bandwidth should be around 11 MHz taking into account the space for sound carrier and a small guard band of around 0.25 MHz. Using such large transmission BW will limit the number of channels in the spectrum allotted for TV transmission. To accommodate large number of channels in the allotted spectrum, reduction in transmission BW was considered necessary. The transmission BW could be reduced to around 5.75 MHz by using single side band (SSB) AM technique, because in principle one side band of the double side band (DSB) AM could be suppressed, since the two side bands have the same signal content.

It was not considered feasible to suppress one complete side band due to difficulties in ideal filter design in the case of TV signal as most of the energy is contained in lower frequencies and these frequencies contain the most important information of the picture. If these frequencies are removed, it causes objectionable phase distortion at these frequencies which will affect picture quality. Thus as a compromise only a part of lower side band is suppressed while taking full advantage of the fact that:

(*i*) Visual disturbance due to phase errors are severe and unacceptable where large picture areas are concerned (*i.e.* at LF).

(*ii*) Phase errors become difficult to see on small details (i.e. in HF region) in the picture. Thus low modulating frequencies must minimize phase distortion where as high frequencies are tolerant of phase distortions as they are very difficult to see.

The radiated signal thus contains full upper side band together with carrier and the vestige (remaining part) of the partially suppressed LSB. The lower side band contains frequencies up to 0.75 MHz with a slope of 0.5 MHz so that the final cut off is at 1.25 MHz.

Because of the following reasons the negative modulation is prefered as compared to the positive modulation.

1. Effect of Noise is minimized.
2. No bright spots appear due to noise.
3. The instantaneous amplitude of carrier decreases with that of modulating signal.
4. RF noise pulses will not cause any adverse affects on picture.
5. Peak Transmitter power is more.
6. AGC circuit has stable reference level.

END TERM EXAMINATION [MAY–2016]
EIGHTH SEMESTER [B.TECH]
CONSUMER ELECTRONIC [ETEC–408]

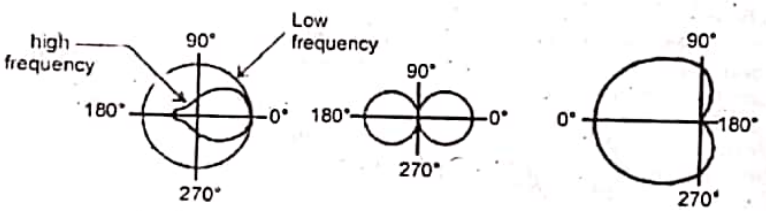
Time : 3 hrs. **M.M. : 75**

Note: *Attempt any five questions including Q. no. 1 which is compulsory. Select one question from each unit.*

Q.1. (a) Explain directivity of microphone. **(2.5×10=25)**

Ans. The pattern of sensitivity of a MICROPHONE according to direrection, usually demonstrated as a polar diagram where the length of the radius in any direction given the response in decibels of the microphone.

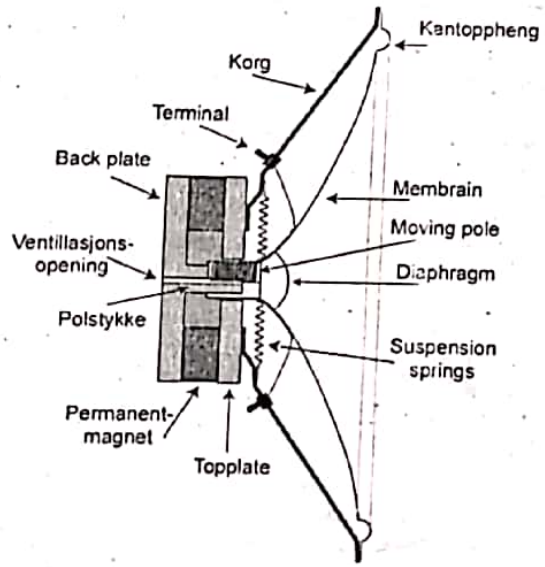
Usaually this repsonse is measured for various frequencies, the results of which may be combined in a single diagram, since in many cases a uniformity of response over a large frequency range is desirable. The directional characteristics of the acoustic radiation of any sound source including loudspeakers may also be indicated by such diagrams.



Omni-directional Bi-directional Uni-directional

Q.1. (b) Specify the utility of electrodynamic loudspeaker.

Ans. An lectrodynamic loudspeaker or field coil loudspeaker is a dynamic loudspeaker in which th field is produced by an electromagnet rather than by a permanent magnet.



An electrodynamic loudspeaker therefore has two coils:

The voice coil common to all dynamic y, positioned in the air gap between the pole pieces, the motion of which moves the loudspeaker cone.

A fixed field coil which together with its magnetic core replaces the permanent magnet of other dynamic loudspeakers.

The first electrodynamic loudspeakers were produced in the 1930, to address the problem that strong permanent magnets of the time were extremely heavy. A compromise was therefore necessary between loudspeaker efficiency, which required the strongest possible magnet, and weight. The use of a strong but relatively light electromagnet solve this problem.

Q.1.(c) Explain different pressure gradients in microphone.

Ans. A microphone in which both sides of the diaphragm are exposed to the incident sound. The microphone is therefore responsive to the pressure differential (gradient) between the two sides of the membrain. Sound waves parallel to the plane of the diaphragm produces no pressure differential, and so pressure-gradient microphones have figure-eight directional characteristics. These are also sometimes called "velocity microphones", since the output voltage is proportional to the air particle velocity.

Q.1.(d) Differentiate between woofer and tweeter.

Ans. The main difference between woofers and tweeters is that the woofers are a lot larger than the tweeters. A good woofer might be 12 inches in diameter or more. There are a couple of reasons for that. First of all, the speaker has to move slower and the diaphragm (the speaker cone) has to move farther to create the sound wave. Secondly, the speaker must produce a higher volume of sound, as low frequency sound waves don't travel as well as high frequency ones do and are much more likely to dissipate and be absorbed by surfaces they come into contact with.

Tweeters do not interact with their cabinets at all, and at times are used without a cabinet. While the construction is similar to a standard electromagnetic speaker, they usually use a dome-shaped diaphragm in place of a speaker cone. These are referred to as "dome tweeters." This diaphragm can either be made of plastic, plastic impregnated silk, aluminum or titanium. Each material type produces its own unique sound characteristics.

Since tweeters are small, they don't produce a lot of volume. To help this, many are attached to a horn. This horn resonates or vibrates with the tweeter, mechanically amplifying the sound that it produces, in much the same way that a trumpet or other brass instrument amplifies the buzzing of the musician's lips.

Q.1.(e) Derive an expression for maximum usable frequency.

Ans. Derivation for maximum usable frequency by tap-recorder/player system. One cycle variation of audio covers a distance of λ on the tape

let time period = T

in T seconds distance covered = λ

in 1 second distance covered = λT

Which is also call as speed (S)

$$\Rightarrow \quad S = \lambda/T$$

Let $$\frac{1}{T} = fm$$

$$\Rightarrow \quad fm = s/\lambda \qquad (i)$$

For better reproduction G (gap width of head)

$$= \lambda/2$$

$$G = \lambda/2$$

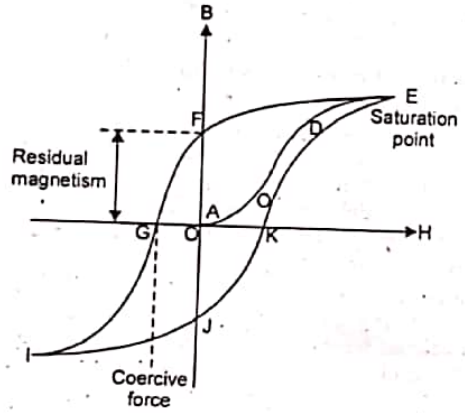
$$\Rightarrow \quad \lambda = 2G \qquad ...(ii)$$

Putting (ii) in (i) we gat:

$$\boxed{fm = \frac{s}{2G}}$$

Q.1.(*f*) What is the need of biasing in magnetic recording?

Ans. The Hysteresis curve for magnetic materials which shows that the curve (characteristic) is non linear. While recording and reproduction, the magnetic tape passes through the hysteresis curve. The magnetizing force (H) is determined by the number of turns on the head winding, current through it, produced magnetism (B) and the induced magnetization in the tape.



When a particle on the magnetic tape comes across the head gap, it is magnetized upto E (Figure). When the particle leaves the head, though there is no magnetizing force (H) on it, even it has some magnetism called residual magnetism (OF in the figure).

This residual magnetism leads to distortions. Therefore, a technique is used during recording, reproduction and erasing, which makes the above operations only in the linear region of the hysterists curve, which makes the operations free of distortions and noise. This explains the need of biasing, for which Biasing oscillators are used.

Q.1.(*g*) Explain noise reduction system in magnetic tapes.

Ans. A Dolby noise-reduction system, or Dolby NR, is one of a series of noise reduction systems developed by Dolby Laboratories for use in analog magnetic tape recording. The first was Dolby A, a professional broadband noise reduction for recording studios in 1965, but the best-known is Dolby B (introduced 1968), a sliding band system for the consumer market, which helped make high fidelity practical on cassette tapes which used a relatively noisy tape size and speed. It is common on high fidelity stereo tape players and recorders to the present day. Of the noise reduction systems, Dolby A and Dolby SR were developed for professional use. Dolby B, C, and S were designed for the consumer market. Aside from Dolby HX, all the Dolby variants work by companding, or compressing the dynamic range of the sound during recording and expanding it during playback.

Q.1. (*h*)What are advantages of keyed AGC?

Ans. A keyed AGC circuit is responsive to the peak level of synchronizing signal components of a composite video signal for generating an AGC control voltage in a television receiver. A peak detector samples the peaks of the synchronizing signal components during keying intervals. Signal translating means are keyed by an AGC keying signal to provide charging and discharging currents for an AGC filter capacitor which are each a function of the signal level stored by the peak detector. A discharge circuit is responsive to the absence of the AGC keying signal to continuously discharge the peak detector during video scanning intervals to prevent the retention of charge by the peak detector resulting from noise or video signal information.

Adavantages of keyed AGC are as follows:-

The AGC rectifier is allowed to conduct only horizontal sync pulse periods. With the help of flyback pulses derived from the output of the hoirzontal deflection circuit of the receiver. Video signal is also coupled to AGC rectifier to produce AGC voltage proportional to the signal strength.

However the AGC transistor is kept at the cut-off level so that it conducts only when keying pulse is applied for a short duration.

This shows that rectifier conducts only when the blanking and sync pulses are on.

Advantages of Keyed AGC System: A long time constant to filter out 50 Hz ripple is no longer necessary because conduction take place only during horizontal retrace period and no undue build up of voltage occurs during vertical sync intervals. The relatively short time constant filter used to remove 15625 Hz ripple enables the AGC bias to respond to flutter and fast change of stations.

So producing a steady picture and sound output.

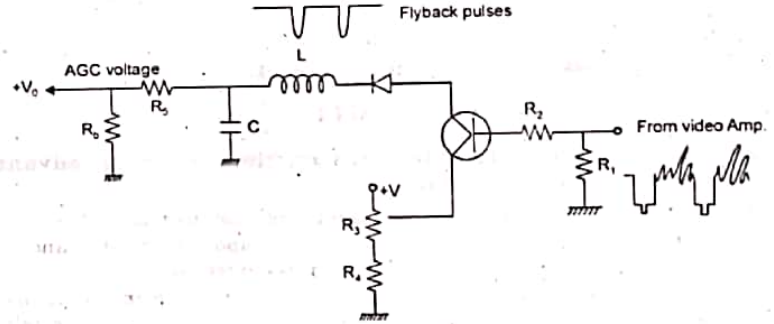


Fig. Transistor Keyed AGC

AGC voltage developed is a true representation of the peak of fixed sine level and thus corresponds to the actual incoming signal strength.

Noise effects are minimised because conduction is restricted to a small fraction of the total line period.

Q.1.(*i*) Why we use trap circuit in monochrome receivers?

Ans. In intermediate frequency amplifiers for monochrome television receivers, it is conventional to provide trap circuits adapted to attenuate the accompanying sound carrier relative to the picture carrier. For example, in monochrome receivers incorporating the 'so-called intercarrier sound system, optimum operating conditions generally require a ratio between picture carrier and sound carrier amplitudes at the output of the IF amplifier of the order of 15 to 1. Additional 'traps in the receivers video circuits may be

provided and tuned to the intercarrier beat to provide the further attenuation of sound components in the video channel necessary to elimina-the sound interference with picture. In color receivers, however, the proper handling of sound components in LF and video circuits poses a more complicated problem. A color television composite picture signal in accordance with present FCC standards includes a color subcarrier of approximately 3.58 mc. Chrominance information is conveyed by sidebands of the color subcarrier, one sideband necessarily extending close to the accompanying sound components in the frequency spectrum of a color television signal. If attenuation of sound carrier relative to picture carrier in the color receivers IF amplifier is only of the aforesaid order of 15 to 1, an objectionable beat of approximately 920 kc. (the difference between the 3.518 color subcarrier and the 4.5 intercarrier beat) appears with significant amplitude in the video output of the second detector. An interfering signal of this frequency cannot be conveniently trapped out in the subsequent video circuits. To eliminate this beat between color subcarrier and sound in the video channel, it is imperative that the :sound carrier be greatly attenuated before its application to the video second detector, a nonlinear circu-it element wherein such a beat will otherwise be produced.

Q.1. (j) Calculate the peak value of resultant signal when saturated yellow colour is added to the luminance y signal.

Ans. For yellow colour signal: R = IV, G = IV, and B = OV

$$Y = 0.3 + 0.59 + 0 = 0.89$$

$$B - Y = 0 - 0.89 = -0.89$$

$$R - Y = 1 - 0.89 = 0.11$$

$$C = \left[(B-Y)^2 + (R-Y)^2\right]^{1/2} = 0.9$$

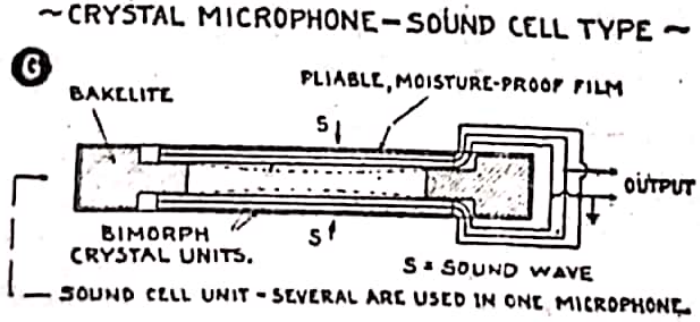
When chroma signal is added to Y - Signal, then

Peak Positive = 0.89 + 0.9 = 1.79

UNIT-I

Q.2.(a) Explain the principle, construction, working, advantages, disadvantages of crystal microphone. **(6.5)**

Ans. Two types of crystal microphones are in common use today, to wit: 1st, the sound-cell type in which the sound waves act directly upon the crystal; and 2nd, the diaphragm type which uses a diaphragm to the center of which the crystal is attached by means of a mechanical link. In either of these units, the principle of operation depends upon the piezoelectric effect or voltage produced in certain crystals when subjected to mechanical stress (bending, etc.).

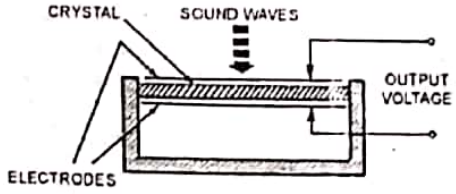


The sound-cell unit is an assembly of 2 "bimorph" Rochelle salt crystal elements in a bakelite frame. The bimorph elements, in turn, are each made up of 2 crystal plates with electrodes attached, cemented together so that an applied sound will cause a bending of the assembly, and produce a voltage. The mounting is such that mechanical shocks have little effect on the unit.

No diaphragm is used, the sound impulses actuating the crystal elements directly. An exceptionally wide frequency range, even into the super-audible band and on down to zero frequency, may be obtained from this unit. Of the 2 types of crystal microphones, the sound-cell has the better frequency characteristics. Its output is very low, however, so it requires greater amplification. This type of crystal microphone is usually employed for full-range musical pick-up.

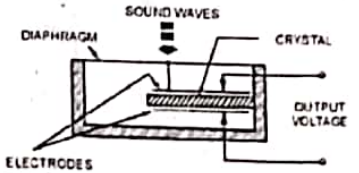
The diaphragm type will give much greater output, eliminating in most cases the need for a preamplifier, but it has the disadvantage of limited frequency response. This type of crystal microphone is most used for voice work

One disadvantage of carbon microphones is that of a constant BACKGROUND HISS (hissing noise) which results from random changes in the resistance between individual carbon granules. Other disadvantages are reduced sensitivity and distortion that may result from the granules packing or sticking together. The carbon microphone also has a limited frequency response. Still another disadvantage is a requirement for an external voltage source. The disadvantages, however, are offset by advantages that make its use in military applications widespread. It is lightweight, rugged, and can produce an extremely high output. CRYSTAL MICROPHONE.—The CRYSTAL MICROPHONE uses the PIEZOELECTRIC EFFECT of Rochelle salt, quartz, or other crystalline materials. This means that when mechanical stress is placed upon the material, a voltage electromagnetic force (EMF) is generated. Since Rochelle salt has the largest voltage output for a given mechanical stress, it is the most commonly used crystal in microphones. View (A) of figure is a crystal microphone in which the crystal is mounted so that the sound waves strike it directly. View (B) has a diaphragm that is mechanically linked to the crystal so that the sound waves are indirectly coupled to the crystal.



DIRECTLY ACTUATED TYPE

(A)



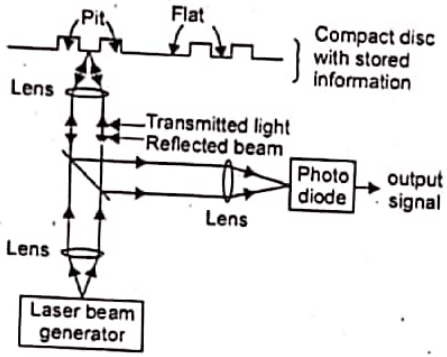
DIAPHRAGM TYPE

(B)

Q.2.(b) How is audio information stored on a CD retrieved in a CD player? Draw a simple diagram showing reflection of laser beam from a CD and conversion of information into binary datas. (6)

Ans. Inside the CD player the information stored on the Compact Disc is in the form of pit and flat.

Following mechanism is used for retrieving the stored information.



There is neglible reflection from the pit and almost full reflection from the flat portion.

Pits Corresponds to 0's stored Flats corresponds to 1's stored.

In this manner the information stored in the form of 0's and 1's is retrieved.

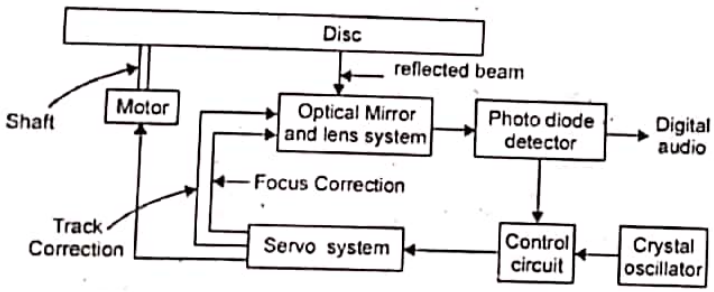
It is obtained by means of photo diodes array which converts the laser light into into electrical bits. The digital output of diode is converted and processed in the form of codes.

The control signals allow any combination of tracks to be played in any sequence by simply pressing the switches from the key board.

Also a display of text is provided to monitor the track being played.

The clock signal is obtained from the disc itself it is compared with the crystal oscillaters signal and any discrepancy occuring is feed to the servo system to correct the error occuring.

The whole process is shown in the block diagram.



Block Diagram of CD Player System:

Scanning of tracks is done by moving the laser beam section from centre to the outer peripheral, since circumferance of outer spiral is more than the inner spiral.

But we have to maintain the track speed and constant that is called as constant Linear velocity. This is done by changing the speed of disc from 500 r.p.m. of the centre to 200 r.p.m. at the outer peripheral.

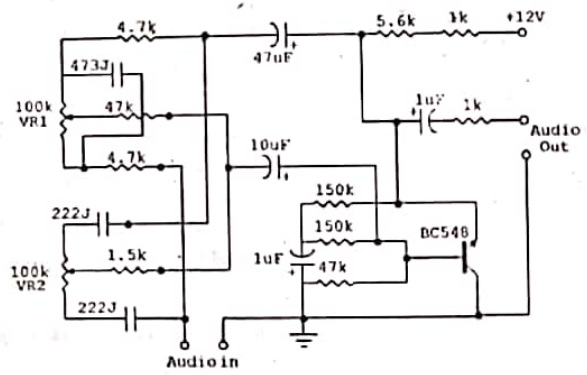
The scanning speed is about 1.2 m/s and this gives a playing time of 160 minutes and 20 minutes for error correction.

Q.3.(a) Explain tone control in a Hi-Fi system and draw the circuit for bass and treble control. (6.5)

Ans. Hi-Fi or hifi—reproduction is a term used by home stereo listeners, audiophiles and home audio enthusiasts to refer to high-quality reproduction of sound to distinguish it from the lower quality sound produced by inexpensive audio equipment, or the inferior quality of sound reproduction that can be heard in recordings made until the late 1940s.

Ideally, high-fidelity equipment has inaudible noise and distortion, and a flat (neutral, uncolored) frequency response within the intended frequency range.

An audio equalizer circuit is used to adjust the frequency response of an audio signal. This is a simple equalizer circuit for controlling the bass and treble (tone) of an audio amplifier. For use this equalizer circuit in amplifier, equalizer's output should be given in the input of amplifier. So that the main input audio signal's bass and treble could be controllable before the amplify section.



As shown here the bass and treble controller circuit has two variable resistor(VR1 & VR2) to control the bass and treble. VR1 for Bass Control and VR2 for Treble Control.

This Bass and Treble controller circuit needed a 12Volt power supply. I would have designed it in that way because 12V is used in most of the audio amplifier circuit. and since equalizer circuit is used with audio amplifier, so be no extra power supply will required for this Equalizer. This audio equalizer circuit is very easy to build and has a very good quality.

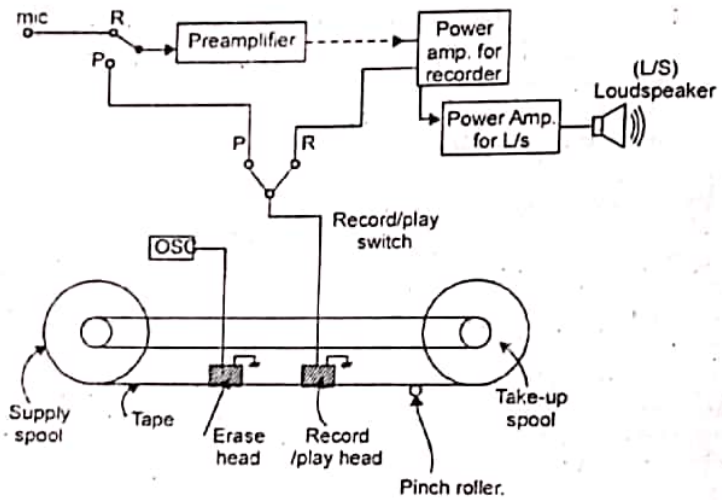
Q.3.(b) With the help of diagram, explain tape transport mechanism. (6)

Ans. The tape should move at a steady speed for the recording and playback process.

The basic tape transport mechanism is shown as follow:

It consist of the following components:

Motor: It is a synchronous type motor. This is having a characterstic of keeping a constant speed irrespective of variation of supply voltage and load. This reduces wow and flutter noise.



2. Pinch roller (Capston): Capston is a spindle machined accurately and pulls the tape past the head. The tape is pressed against the capston by means of a rubber covered pinch roller.

3. Flywheel: It is a heavy wheel made of a metal and is fitted to the capston shaft. This damps minor variation in the speed.

4. Tape Guides: These provide the desired tension in the tape and keep it in the right direction. All the bearings over which the tape passes must be of high quality.

5. There are two spools:

(*i*) Supply spool which provide the tape to the other direction.

(*ii*) Take-up spool: The spool which take the reel from the other side.

UNIT–II

Q.4.(*a*) With the help of a block diagram, explain the various controls in a T.V Receiver. **(6.5)**

Ans. Radio receiver designed to amplify and convert the video and audio radio-frequency signals of a television broadcast that have been picked up by a television antenna; the receiver reproduces the visual image broadcast and the accompanying sound. Television receivers are designed for color or black-and-white operation; both non portable and portable models are produced. Those manufactured in the USSR are capable of receiving signals from television stations transmitting in specifically assigned portions of the very-high-frequency (VHF) band (48.5–100 megahertz and 174–230 megahertz; 12 channels) and ultrahigh-frequency (UHF) band (470–638 megahertz; several tens of channels).

Television receivers must simultaneously amplify and convert video and audio radio-frequency signals. They are usually designed with a superheterodyne circuit, and versions differ in the methods used to extract and amplify the audio signal.

The tuner selects the signals of the desired channel and converts them to a lower frequency within the intermediate-frequency passband. The signal-processing circuits include an intermediate-frequency amplifier for the video signal, an amplitude detector, a video amplifier for the brightness signal, and, in color receivers, a color-processing circuit for the chrominance signal. The processing circuit produces a brightness signal

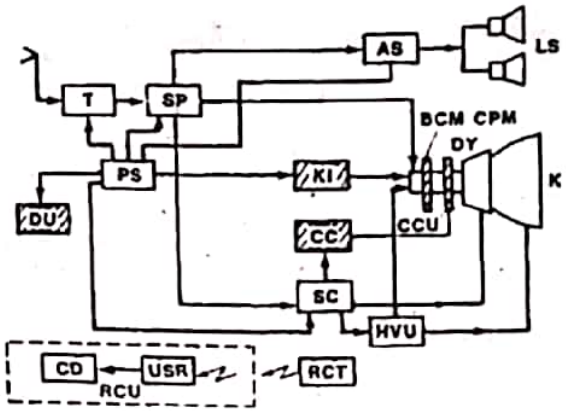
and a color-difference signal, which are fed to the control electrodes of a kinescope; an audio signal, which is fed to the audio channel; and horizontal and vertical synchronizing pulses (or a composite television signal), which are fed to a scanning generator. In the color television system used in the USSR, the color-processing circuit for the chrominance signal consists of a band-pass amplifier, in which the chrominance signal is extracted, channels for the direct and delayed signals, an electronic switching device, two frequency detectors for the color-difference signals, a matrix circuit, and amplifiers for the three color-difference signals. The color-processing circuit has provisions for the extraction and decoding of the chrominance signal and for line selection, as well as chrominance disconnect circuits that operate when black-and-white transmissions are received.

The scanning generators include horizontal and vertical scanning circuits that produce sawtooth currents in the horizontal and vertical scanning coils of the deflection system. The high voltage for feeding the second anode of the kinescope (a voltage of 21–25 kilovolts in color receivers) is derived from a special high-voltage winding of the line transformer or by rectifying pulses from the transformer; the voltage for the focusing electrode (approximately 5 kilovolts in a color television set) is similarly derived. In a color receiver, this circuit has transformers to correct pincushion distortion in the television raster.

In order to ensure the dynamic convergence of the beams in a three-beam color kinescope, a convergence circuit is used, in which currents with special wave forms are derived from the horizontal and vertical scanning pulses and are then fed to the windings of the convergence magnets. The convergence magnets are permanent magnets with windings; they provide for the static convergence of the beams. A convergence control unit containing the three convergence magnets is positioned on the neck of the kinescope, as are the blue-corrector and color-purity magnets.

The kinescope's interface includes static and dynamic white balance controls, switches for extinguishing the electron guns, and regulators for focusing the beams. The demagnetizing circuit for a color kinescope creates a damped alternating current in a demagnetizing loop that circles the kinescope screen. The current demagnetizes the shadow mask and tube rim, which are made of steel.

The audio section consists of an amplifier for the difference frequency, which in the USSR is 6.5 megahertz, a frequency detector for the audio signal, and a low-frequency amplifier from which the audio signal is fed to a high-quality acoustical system, usually composed of several loudspeakers. The power-supply section converts mains voltage into the supply voltages for all components of the television set, including the kinescope and vacuum tube heaters.



Abbreviations: Block diagram of a television receiver. (The hatched blocks are present only in color receivers.) (T) tuner, (SP) signal-processing circuit, (K) kinescope, (DY) deflecting yoke, (SC) scanning circuits, (HVU) high-voltage unit, (CC) convergence circuits, (CCU) convergence control unit, (BCM) blue-corrector magnet, (CPM) color-purity magnet, (KI) kinescope interface, (DU) demagnetizing unit for kinescope, (AS) audio section, (LS) loudspeakers, (PS) power supply, (RCU) remote-control unit, (USR) ultrasonic receiver, (CD) control device, (RCT) remote-control transmitter.

Q.4.(*b*) With the help of a block diagram, explain the working of a monochrome T.V camera. **(6)**

Ans . The aim of a basic television system is to extend the sense of sight beyond its natural limits and to transmit sound associated with the scene. The picture signal is generated by a TV camera and sound signal by a microphone. In the 625 line CCIR monochrome and PAL-B colour TV systems adopted by India, the picture signal is amplitude modulated and sound signal frequency modulated before transmission. The two carrier frequencies are suitably spaced and their modulation products radiated through a common antenna. As in radio communication, each television station is allotted different carrier frequencies to enable selection of desired station at the receiving end.

The TV receiver has tuned circuits in its input section called 'tuner'. It selects desired channel signal out of the many picked up by the antenna. The selected RF band is converted to a common fixed IF band for convenience of providing large amplification to it. The amplified IF signals are detected to obtain video (picture) and audio (sound) signals. The video signal after large amplification drives the picture tube to reconstruct the televised picture on the receiver screen. Similarly, the audio signal is amplified and fed to the loudspeaker to produce sound output associated with the scene.

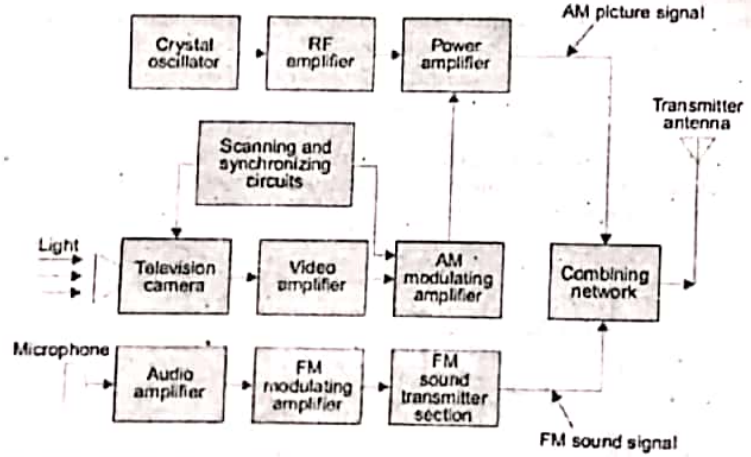


Fig. Elementray block diagram of monochrome television transmitter

An oversimplified block diagram of a monochrome TV transmitter is shown in Fig. The luminance signal from the camera is amplified and synchronizing pulses added before feeding it to the modulating amplifier. Synchronizing pulses are transmitted to keep the camera and picture tube beams in step. The allotted picture carrier frequency

is generated by a crystal controlled oscillator. The continuous wave (CW) sine wave output is given large amplification before feeding to the power amplifier where its amplitude is made to vary (AM) in accordance with the modulating signal received from the modulating amplifier. The modulated output is combined (see Fig.) with the frequency modulated (FM) sound signal in the combining network and then fed to the transmitting antenna for radiation.

Q.5.(*a*) Draw diagram of scanning and EHT circuits and explain there working. **(6.5)**

Ans. Fields and Frames:

1. Moving Pictures (video) appears the same as real life - but in reality is a quickly displayed series of images, or pictures

2. Television camera's take 30 pictures each second

3. Movie camera's take 24 pictures each second - which are converted to 30 per sec for TV using Telecine

4. TV calls one picture a Frame - it breaks each frame up into two interlaced fields

5. The Television screen displays 60 fields each second

6. We define the 60 fields as 30 pairs of fields, and each pair is called a Frame

7. Therefore the Television screen displays 30 Frames each second (the exact number is 29.97- rounded off)

8. In reality, physically, there are no frames - it is a concept to denote one full image- what is scanned onto the screen is fields

9. Our eyes and brain meld the fields together so that we perceive it as smooth, flowing video

Scanned Horizontal Lines

1. Each Field is comprised of 262.5 horizontal lines which are scanned onto the screen, left to right,

2. Each line is scanned below the previous line

3. There is one odd Field (Field 1) and one even Field (Field 2)

4. The odd field scans lines 1, 3, 5, etc and the even field scans lines 0, 2, 4, etc - hence the term interlaced

5. The two field's interlaced lines mesh perfectly to create one full frame of lines 1,2,3,4, etc

6. There are 525 horizontal lines total in each frame, 262.5 lines per field - but only 91% of them are visible

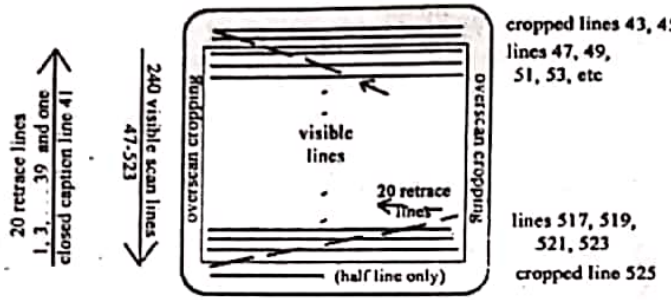
7. The scanning beam is turned off for all invisible lines

8. 40 lines are for vertical retrace and are invisible, 2 lines are for closed captioning info and are also invisible

9. 483 lines are active - meaning the scanning beam is turned on

10. A few of the active lines (3 to 6 lines) are cropped

11. The final number of visible lines after cropping is approximately 480.



Field 1 Scanning (262.5 lines)

Q.5.(b) List major faults and their remedies in a T.V receiver. (6)

Ans. 1. CRT television has no image: No image is a very common problem with cathode ray tube TVs. If you are facing such issue then check the obvious things first i.e. verify whether your TV is plugged in correctly and is receiving sufficient power for operation. If the power is OK, then check the video settings (like brightness, sharpness, contrast and picture settings). If the settings are fine then there can be problem in the video cable and hardware. If the basic diagnosis comes out fine then it might be the time to call a professional TV repair person.

2. Bowed picture or images not lined up: This is a very common picture problem with CRT TVs. It is usually caused by the failure of an internal circuit called the convergence circuit. The circuit has convergence ICs, which when go bad create the problem of bowed picture. Sometimes bad or faulty soldered-in fuses and resistors can also cause image distortion. A technician or a PRO can easily repair this sort of problem in-home.

3. CRT displays one horizontal line in the center when turned-on: Many time it happens that there appears a single thin horizontal line on the CRT TV screen. The probable cause of this problem can be a faulty yoke with a defective or burned coil inside it. The other probable cause can be loose contact between the yoke and the main board. The third possible cause can be a defective capacitor

4. Single vertical line in the center of screen: Some time when you power on your CTR TV you see a single thin vertical line on the screen. The probable cause of this problem can be a faulty yoke with a defective or burned coil inside it. Other reason can be defective vertical ICs. The ICs may have lost contacts with solder joints because of the heat production during operation

5. CRT TV crackles when powered up or emits a strong electrical odor: This is not a very common problem. The most prominent reason is cathode ray tube failure. The minor crackling noise is due to high voltage arcing. The possible reason behind the burning smell is caused by insulation burn. In such situation, immediately unplug the TV from the power outlet. Call a professional TV repair person and get it corrected

6. Colorful shadows on the sides: Whether you have a CRT TV or owned it before, you must have witnessed at some point of time, a colorful shadow on the sides of the screen (can be seen as reddish orange shadow in the picture). It is mainly due to presence

of any magnetic device near the TV. Magnets placed near a CRT can damage the set's "shadow mask," which can cause the wrong colors to appear in that area

Shadow mask is located behind the glass screen, as shown in the above graphical Cathode Ray Tube picture. High-power magnets can sometime cause permanent damage to the CRT

7. Bad sound or no sound from the TV: No sound or less sound is a commonly heard problem with CRT TVs. The most possible reason is faulty speakers. Other reasons can be damaged audio amplifier, a low supply voltage to the amplifier or a faulty audio IC. There can be other reasons as well like some faulty internal wiring.

UNIT–III

Q.6.(a) Explain construction and working of Trinitron picture tube. (6.5)

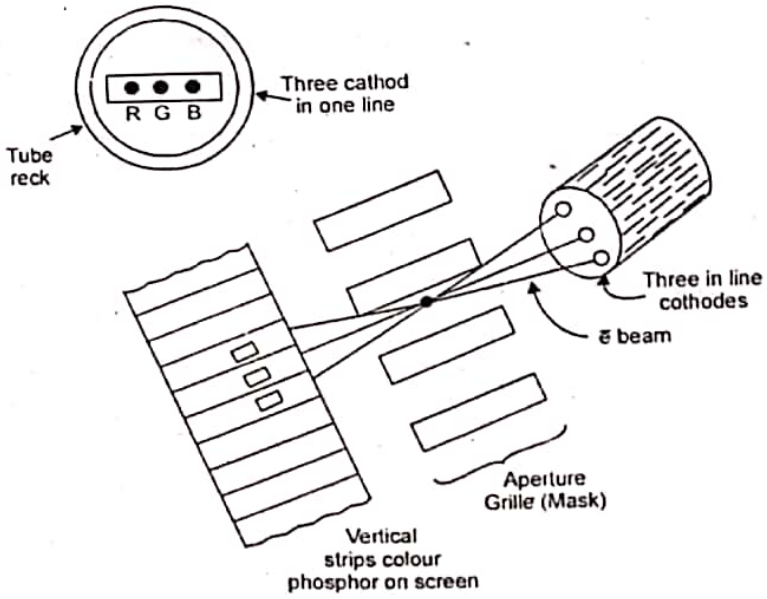
Ans. Working Principle of Trinitron Picture Tube.

Trinitron or three-in-line cathodes. This picture tube was developed by 'Sony' corporation of JAPAN around in 1970. It employs a single gun having three in line cathodes. This simplifies the construction problem since Three electron gun assembly is to be accomodated.

Three phosphor triads are arranged in vertical strips as in precision-in-line picture tube.

A metal aperture grille like mark is provided very close to the screen. It has one vertical slot for each phosphor triad.

Three beams are bent by an electrostatic lens system. So appear to emerge from the same fiat in the lens assembly.

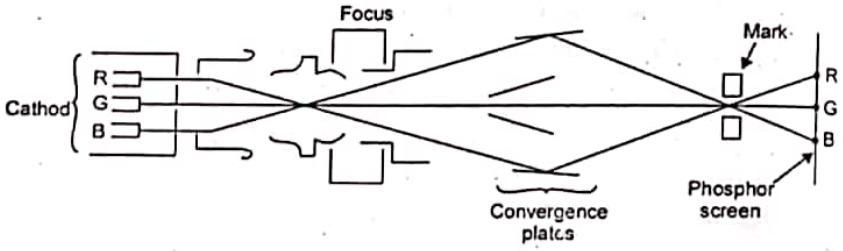


Since the beans have a common focus plans, a sharper image is obtained with good focus over the entire picture area. All this simplifies convergence problems to fewer adjustmants are necessary the logic schematic for the trinitron picture tube is as shown below.

Refined version of trinitron picture tube came into existance in year 1978. It incorporates a low magnification electron gun assembly, long focusing electrodes a and large aperture lens system.

The new high precision deflection yoke with minimum consergence adjustments provides a high quality picture with very good resolution over large screen display tube.

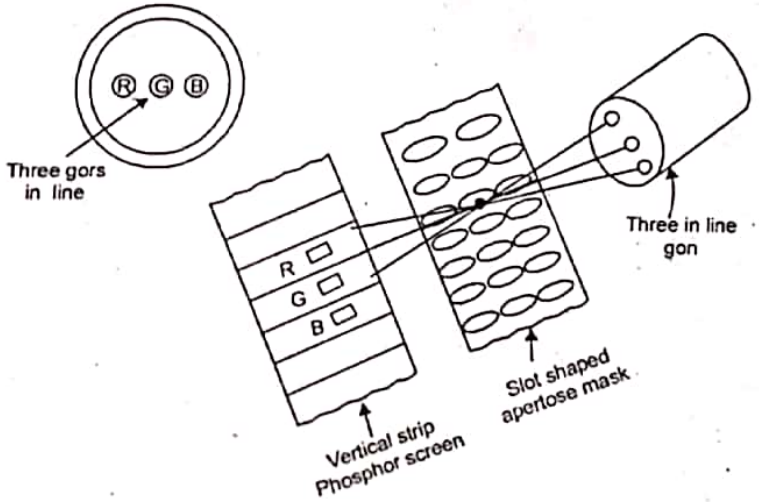
Trinitron Gun Structure:



Precision-in-line (PIL) Colour Picture Tube

In this type of picture tube following important feature exist.

1. There are three different gun for each colour separately.
2. These guns are alligned precisely in horizontal line.
3. This in line gun configuration helps in simplyfying the convergence adjustments.



To obtain the same colour fineness as in delta-gun tube, the horizontal spacing between the strips of same colour is made equal to that of the triads of dots in case of delta-gun picture tube.

PIL Picture tube is more efficient e.g. it has more electron transparency and it requires fewer convergence requirement because of inlined electron gun structure.

Q.6.(b) With the help of block diagram explain PAL TV receiver. **(6)**

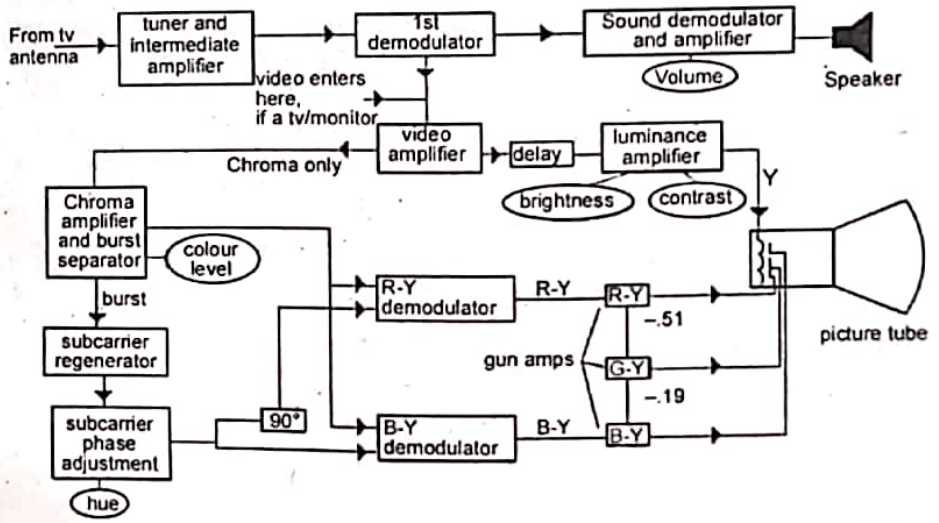
Ans. In a colour television receiver, additional circuits are provided to deal with the colour.

The only difference in the IF circuit is the importance of bandwidth for colour receivers. Remember that video frequencies around 3.58 MHz just show details in monochrome, but these frequencies are essential for colour information. Without them, there is no colour. This is why the fine tuning control on colour television sets must be tuned exactly, or else the colour disappears, along with the higher resolution.

The sound is usually taken off before the video detector in colour sets, and a separate converter is used for it, instead of taking it from the video detector. The reason that this is done is to minimize a 920 KHz beat signal that can result between the 3.58 MHz colour subcarrier and the sound carrier signal. This signal would show up as interference in the television picture.

The output from the video detector is sent to two places: a series of colour circuits, and a luminance output amplifier.

The luminance amplifier also serves as a cutoff filter for frequencies above 3.2 MHz, thus removing all colour information from the luminance video signal and, alas, some of the sharpness and detail. On this amplifier is where you will find your brightness and contrast controls.



In the colour recovery circuits, several things happen. First, the video detector's output is sent through a colour "band pass" filter, which leaves us with just the chrominance information - the luminance has been removed. This chroma output contains both the colour information for the picture, and the colour burst. It is then sent to a burst separator to detect the phase and level of the colour burst. This is where you will find your "colour" control. Now we'll have a reference for the colours within the picture, which is sent to a crystal oscillator which generates constant 3.58 MHz subcarrier of the correct phase. This oscillator's phase can be adjusted - this is your hue control. The oscillator is used with two colour demodulators to recover the R-Y and B-Y colour difference signals. The continuous wave subcarrier is delayed by 90 degrees of phase before it enters the R-Y demodulator. The R-Y and B-Y signals are combined further to recover the G-Y signal.

All three signals are then sent to the colour picture tube's grids. There, they are combined with three luminance drive signals in the correct proportions, giving us our familiar RGB signals for driving the electron guns within the picture tube to re-create the colour television picture.

Q.7.(*a*) Explain concept of convergence purity and beam shifting (6.5)

Ans. Purity and Convergence: While deflecting the three beams by vertical and horizontal deflecting coils, it is necessary to ensure that elctron beam should strike the correct pixels or phosphor material and all three colour raster fully overlap each other, This is called as purity of colour.

For obtaining the colour purity, it is required that each beam should strike at the centre of phosphor dots, irrespective of the position of electron gun on the reaster.

This needs precise alignment of the colour beams and is carried out by a circular magnet assembly known as purity magnet.

These circular ring magnets are mounted close to the deflection yoke. This magnet Consist of washer like parts which help in rotating the magnet By this rotation the effective magnetic field strength is charged and so focusing alignment can be made.

The clamps are on the ring magnets and if changing the position of clamps, the magnetic field strength changes and hence alignment requirement can be made easily changing of magnetic field strength w.r.t the clamps positions is shown as follow:

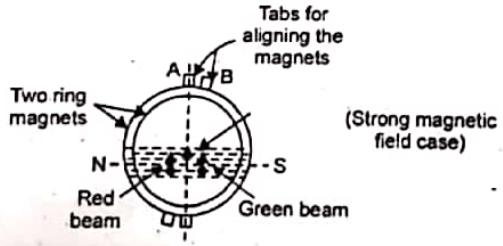


Fig. Two ring megnets with small syacing.

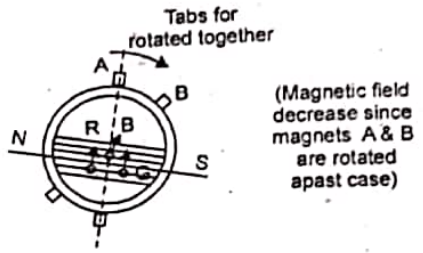
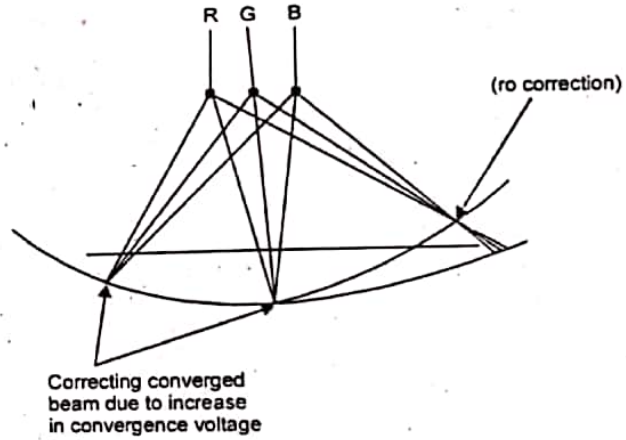


Fig. 2. Change of magnetic field w.r.t change in position of tabs.

Convergence.



The technique of bringing the beams together so that they hit the same part of screen at the same time to produce these coincident rasters is suffered to as convergence.

These errars are caused by (1) non-coincident Convergence plains.

(*ii*) Non-uniformity of deflection field.

(*iii*) Flat surface of picture tube.

The proper adjustment can be made by changing the supply frequency in the electromagnet in the form of pulses.

Q.7.(*b*) Explain color difference signal and its need in synchronous quadratic modulation. (6)

Ans. Chrominance (chroma or C for short) is the signal used in video systems to convey the color information of the picture, separately from the accompanying luma signal (or Y for short). Chrominance is usually represented as two color-difference components: U = B – Y (blue – luma) and V = R – Y (red – luma). Each of these difference components may have scale factors and offsets applied to it, as specified by the applicable video standard.

In composite video signals, the U and V signals modulate a color subcarrier signal, and the result is referred to as the chrominance signal; the phase and amplitude of this modulated chrominance signal correspond approximately to the hue and saturation of the color. In digital-video and still-image color spaces such as Y' CbCr, the luma and chrominance components are digital sample values.

Seperating RGB color signals into luma and chrominance allows the bandwidth of each to be determined separately. Typically, the chrominance bandwidth is reduced in analog composite video by reducing the bandwidth of a modulated color subcarrier, and in digital systems by chroma subsampling.

In analog television, chrominance is encoded into a video signal using a subcarrier frequency. Depending on the video standard, the chrominance subcarrier may be either quadrature-amplitude-modulated (NTSC and PAL) or frequency-modulated (SECAM).

In the PAL system, the color subcarrier is 4.43 MHz above the video carrier, while in the NTSC system it is 3.58 MHz above the video carrier. The NTSC and PAL standards are the most commonly used, although there are other video standards that employ different subcarrier frequencies. For example, PAL-M (Brazil) uses a 3.58 MHz subcarrier, and SECAM uses two different frequencies, 4.250 MHz and 4.40625 MHz above the video carrier.

The presence of chrominance in a video signal is indicated by a color burst signal transmitted on the back porch, just after horizontal synchronization and before each line of video starts. If the color burst signal were visible on a television screen, it would appear as a vertical strip of a very dark olive color. In NTSC and PAL, hue is represented by a phase shift of the chrominance signal relative to the color burst, while saturation is determined by the amplitude of the subcarrier. In SECAM (R – Y) and (B – Y) signals are transmitted alternately and phase does not matter.

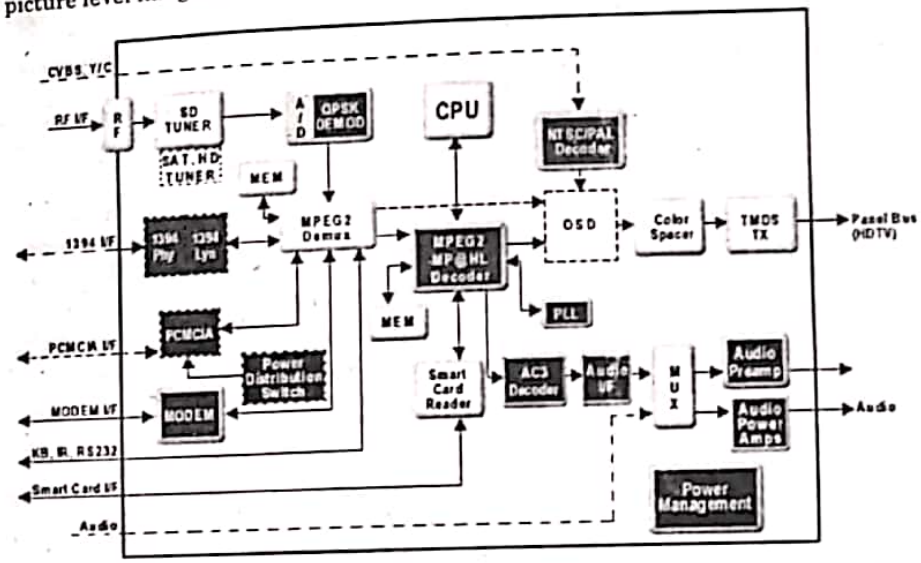
Chrominance is represented by the U-V color plane in PAL and SECAM video signals, and by the I–Q color plane in NTSC.

UNIT-IV

Q.8.(a) Discuss conctruction and working of HDTV **(6.5)**

Ans. HDTV stands for 'High Definition TV'. TV resolution is usually measured in 'lines' (only recently did the notion of 'pixel' arrive..). Over the past 8 decades, TV images have been 'created' by scanning an electron beam onto a phosphorus-like material coated screen, to create lines at a fast rate to create a 'picture'. These traditional TVs are also referred to as 'CRTs' (Cathode Ray Tube). Note that the human eye has an 'inertia' for image processing and if an image projected on the screen (principle used in motion picture) or scanned lines on a TV screen, change with a frequency of greater than 0.1 sec, then we 'see' a 'moving' image. Traditional TV standards consist of pictures between 400-600 lines (Different Color Systems globally are a bit different: PAL that is used in India and in many EU countries uses 540 lines. NTSC used in North America uses 480 lines, etc.). Also note that in the 1930s, given the limitation of analog bandwidth and technology, a decision was made (that has stuck over all these years!) to go for a picture aspect ratio of 4:3. This was much 'squarer' than the 35 mm film aspect ratio in those days.

HDTV changed the aspect ratio back to a more wide-angle movie like format to 16:9. The HDTV format has 1080 interspersed lines. (I will get into the 1080i vs 1080p discussion a bit later). With double the lines and greater 'aspect ratio' – the resolution of HDTV becomes much better than that of the conventional 480i(NTSC)/540i(PAL) 4:3 TV. In fact newer advances in HD (1080p, etc.) are realizing the dream of having motion picture level image quality on a TV Screen.



HD TV Sets: HD or non-HD TV Set? A few years back, this was a choice. Today (even in India) – there's no choice! Almost all LCD/LED/Plasma/Projection/DLP TVs are HD Ready. Major companies have stopped making non-HD TVs (except in the sub 24inch CRT space..eventually these too would go away). In this section, I will provide a quick overview of the different HD TV Sets.

CRT: The oldest technology format was used for HD in the 1990s and early 2000s. With a rear projection approach, the first big screen HD (and non-HD) TVs became a reality. However these are now virtually extinct.

Plasma: Plasma TVs were the first big screen flat TVs to become popular 10 years back. Back then LCDs were not available in big sizes and also refreshed slowly. Plasmas had issues of burn-ins (static image getting burned in permanently onto the screen) and were very heavy (even though they were flat). While Plasma TVs have addressed these issues, they are getting replaced by LCDs.

LCD: LCD (Liquid Crystal Display) TVs are today the most popular format for HDTVs. They have been able to address their earlier limitations of screen sizes and fast refresh rates, and contrast ratios. Now 1080p is quite common resolution available (1920X1080 pixels).

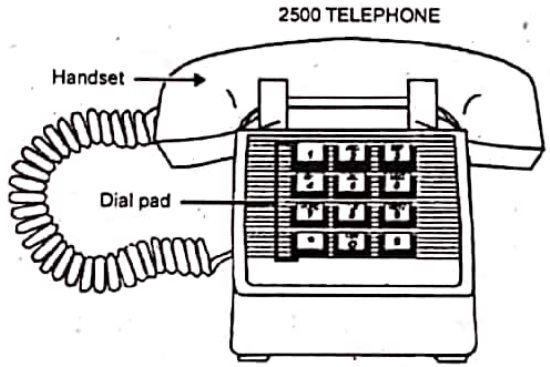
LED: LED TVs represent the new exciting developments on top of LCD TVs – offering even brighter displays and contrast rations. With LED TVs – I doubt if there's any rom left for Plasma TVs.

DLP: The DLP technology and projection TV technology was developed by Texas Instruments earlier last decade. However, the rear projection screens are not flat and have lost out to LCDs/Plasmas. However DLP is still an excellent technology for HD Projection on big movie screens. In fact all digital motion pictures are being shown in some of the new Digital Theaters around the world using DLP Technology (No Film!).

Q.8.(b) Discuss working of touch tone telephone set. (6)

Ans. Working of Touch Tone Telephone Set: A touch-tone-analog telephone set is a single appearance analog telephone with conventional touch-tone i.l dialing. The telephone provides access to features through the use of the * or # dial pad keys and the appropriate feature access codes. There are many types of touch-tone telephones and different types of 2500 telephones. Several have additional buttons and indicators.

The basic 2500-type telephone is illustrated herein, your touch-tone telephone may look different. To familiarize yourself with the buttons and features on your telephone, refer to your telephone set manual or \ the figure below and then read the explanations for the buttons and features.



Dial Pad : The standard 12-button pad for dialing phone numbers and accessing feature.

Handset: For placing and answering calls. This is sometimes called the "receiver". You must lift the handset (go off-hook) before you can use a feature.

Handset Jack: For connecting the handset to the telephone. This jack is usually located on the left side of the telephone.

Line Jack: For connecting the line cord to the telephone. This jack is usually located on the rear or underside of the set.

Ringer Volume Control: A 3-position ringer volume control usually located on the underside of the telephone.

Special Instructions: As you operate the features on your telephone, keep in mind the following general rules.

Carefully follow all the steps listed in the procedure for the particular feature you are using.

If you receive an intercept tone (high-pitched, alternating high and low tone) while attempting to operate any feature, you have taken too much time to complete a procedural step or have made a dialing error. Hang up, get dial tone, and return to Step 1.

To use a feature, you must have the handset off-hook (removed from the cradle of the telephone). You can activate or cancel most features by dialing a 2- or 3-digit code.

You will often see the term flash the switch hook used in the procedures. This means to press and immediately release the button (switch hook) in the handset cradle. Some telephone sets may have a separate FLASH or RECALL button near the dial-pad that serves the same purpose.

Abbreviated Dialing: Allows you to store selected phone numbers for quick and easy dialing. Each number can be a complete or partial phone number, an extension number, or a trunk or feature code. There are four possible types of lists -- personal, group, system, and enhanced. You can have a total of three lists. Numbers on a personal list are programmable by you; numbers on all other lists are programmable only by the system manager. Use as a timesaver for dialing frequently called, lengthy, or emergency numbers.

Automatic Callback: Sends you a special 3-burst ring indicating that a previously busy or unanswered extension is now available. Use to avoid constant redialing when you wish to speak to someone who is frequently busy on the phone, or is in and out of the office.

Note: Can be used only for CalPBX extensions, not outside numbers. Call Forwarding All Calls.

The Call Forwarding feature temporarily forwards all your calls to another extension or to an outside number.

Call Park: Puts a call on hold at your telephone, for retrieval at any extension. Use when you need to go elsewhere to get information during a call, or whenever you wish to complete a call from a different location. Also, if the call received is for someone else, use it to hold the call until the called party can answer it from the nearest available telephone.

Call Pickup: Lets you answer a call at your telephone for another extension in your pickup group. Use when you wish to handle a call for a group member who is absent or otherwise unable to answer. Note: You can use this feature only if you and the called party have been assigned to the same pickup group by 1ST.

Call Waiting: When you are busy on a call, sends a distinctive tone to notify you of another incoming call waiting to be answered. This allows you to complete or hold your present call and pick up the waiting call. It will save you from missing calls, and your waiting caller from having to call back later.

This feature is not available on fax/modem lines which are configured not to send PBX system tones that might interfere with data transmissions. Conference:

Allows you to add a third party to a call, so that you can conduct a three-way conversation. (If you wish to conference more than three parties, call your attendant for assistance.) Use to set up time-saving conferences, or to spontaneously include a third

party important to a discussion. Note: If you have both an active call and a call on hold, you must terminate one of them before you can use Conference.

Hold: Puts a call on hold until you can return to it. While a call is on hold, you can place another call, activate another feature, answer a waiting call, or leave your telephone to perform another task. Use when you , have a call you do not wish to drop, but which you have to interrupt briefly to do something else.

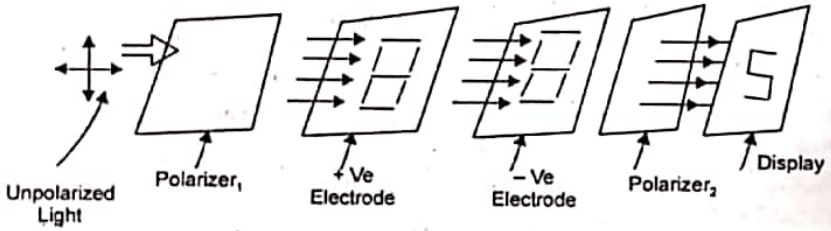
Redial: The Radial (or Last Number Dialed) feature automatically redials the last extension or outside number you dialed.

Q.9.(a) Distinguish between LCD and plasma TV. (6.5)

Ans. Working Principle of LCD TV: Liquid Crystal is a liquid substance that has solid like properties. These are rod shaped molecules which are free to move but are of certain orientation as in solid.

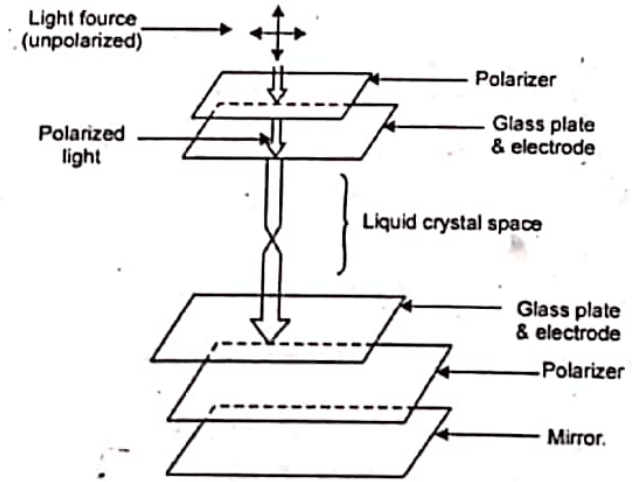
Hence these molecules show the properties of both liquids and solid crystals.

Low Temperation (Solid Crystal) → Medium Temperature (Liquid Crystal) → High Temperature (Completely liquid)



LCD based display monitors are capable to display the colour from 16 to over 1 million.

These are some times called as RGB monitors.



Operating Modes: In basic two modes Liquid crystals Work.

(*i*) Twisted rematis mode (TN)

(*ii*) Super Twisted nematis (STN) mode.

(*i*) TN mode (Twisted Nematic): This involves solution of Biarization axis of linearly blarized lists This is basic and dominant mode.

(*ii*) STN mode (Super Twisted nematic)

Under this mode, the image saity is setter. It is because of faster change in the transmission (realignment of liquid Crystal moleculer)

This mode came into existance since in TN mode rate of change is slow.

Twisting angle of change in TN mode is 90°. Whereas in the come of STN mode it is 180° to 270°.

In STN mode, the liquid crystals are having helical shape and shows elliptical polarization.

Features of LCD displays:

* Pixels acts as optical switch
* To displays the real image quality colour filters are used.
* Common liquid crystals are:

(*i*) Cellulose Triacetate

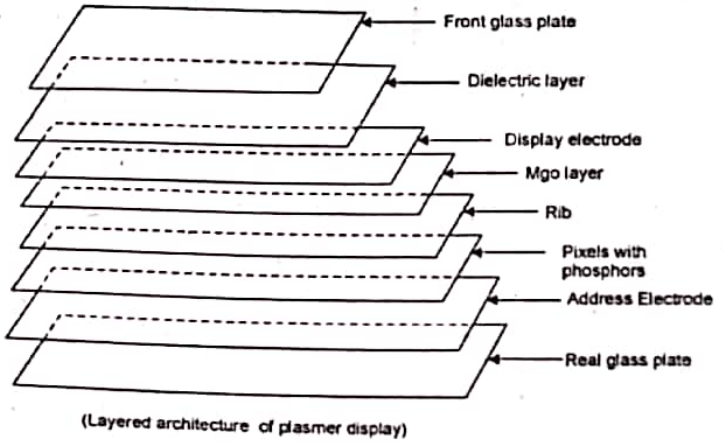
(ii) Polyvinyl alcohol.

* It was invented by Austrian botanist friedrich Reinitzer in 1888.
* The first experimented application was developed by RCA (Radio Corporation of America) in 1968.

Working Principle of Plasma TV

The plasma screen is made up of hundreds of thousands of tiny cells called pixels. Each pixel is composed of a red, blue and green subpixel that are coated with a special phosphor material.

Structure of Plasma Display



(Layered architecture of plasmer display)

Fig. (Layered Architecture of Plasma display)

Each Pixel is also filled with a mixed of neon and xenon gas when electrical current is applied to each pixel, the gas glows to emits ultraviolet light.

The ultra violet light reacts with the phosphor and thus the phosphor material emits a particular colour e.g. red blue or green. The image displayed on the screen is a combination of all the those pixels glowing in a particular pattern.

Advantage of Plasma TV

1. It is having a better Contrast ratio (typically 1,0000011).
2. The colours are visible at a wide angle upto about 180°.
3. Plasma display system is having better response which make it suitable for fast moving vehicles which does not produce any ghosting or shadowing images.
4. Plasma display monitors are available in larger size (42" displays monitors)
5. Plasma display monitors are most suitable for sports channels.

Working principle of LCD:

LCD has in-between character of solid matter and liquid matter. Impressed voltage can change the direction molecules that compose LCD. With the characteristics, optical switch is realized. Here is the explanation citing TN (Twisted Nematic) mode.

An LC cell is comprised of 2 glass substrates with infused LC in between them. The LC cells is sandwiched by 2 polarizing plates, both of which the direction of polarized light is straight. On the surfaces of the two glass substrates facing each other, transparent electrodes are formed in order to apply voltage to LC molecules. On top of them alignment films are formed to align the LC to certain direction. The alignment on the surfaces of facing glass substrates is crossing each other. Therefore, the LC is twisted. When voltage is not applied, the backlight of planate fluorescent material goes through the polarizing plate and becomes a flux of light of incident into the LC cell. After the incidence, it changes the direction by 90 degree to go through the other polarizing plate. When voltage is applied, LC molecules are aligned in the direction of electric field all together. Therefore the backlight cannot go through the LC and the polarization plate. This is the electrical mechanism of optical switch.

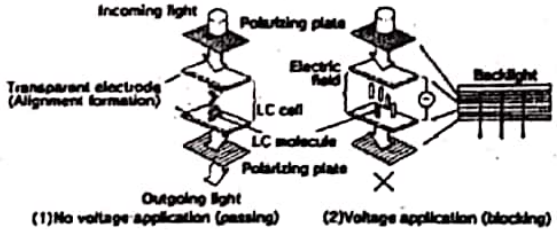


Fig. TFT-LCD mechanism (TN display mode)

In addition, it divide one pixel into three and let through color filters of red (R), green (G), and blue (B) respectively, color display is possible. As for the method of voltage application, passive matrix, to apply voltage directly on LC, was employed at the beginning. In the meantime, for such items that image quality and speed of response are required, TFT (Thin Film Transistor) active matrix is becoming the mainline. TFT has been formed with amorphous silicon (a-Si) in general.

Low temperature poly silicon TFT-LCD

Poly silicon has a crystallographic structure of regularity and can transfer electrons faster 100 times or more. Therefore, optional circuits using p-Si TFT can be made. High temperature p-SI TFT-LCD using quartz substrate is growing rapidly for projector use. However, this quartz type high temperature p-Si that requires heat treatment at 900°C or higher is too expensive to use for mobile phones.

Under such circumstances, formation on alkali free glass substrates of low expansion coefficient is realized at a low temperature (600°C) like a-Si type opened the door to practical applications that require miniaturization and high-definition. This is the low temperature p-Si TFT-LCD. P-Si goes through a laser anneal process of excimer laser (wavelength : 308 nm) irradiated where the temperature goes up 1000°C or higher. (No damage on glass because it happens in a flash).

Certain heat treatment in advance is needed because the film would be peeled off out of the s-Si film (contains approx. 10% hydrogen), which is in the state prior to formation. In connection with this, anneal treatment technique of substrates taken glass contraction into account is also important know-how.

Working Principle of Plasma TV: Plasma TVs work in the same way that fluorescent or neon lights do. An electrical current is passed through a gas, causing it to glow. In the case of plasma TVs, this gas is a combination of argon, neon, and xenon, properitary for each plasma TV manufacturer. The gas is injected into a gap between two glass panels and sealed there in plasma form; hence, the name of this technology.

Each individual pixel is essentially its own light. As electricity passes through the gas, it causes it to glow, striking red, green, and blue phosphors. Specific colors are produced by the amount of each of these phosphors that is caused to glow. However, the amount of glow produced does diminish over time, meaning that old plasma TVs will not produce as brilliant a color as new ones will.

The "half-file" of a modern plasma screen is 60,000 hours. That means that after 60,000 hours of usage, the image will be half as bright as it was when new. To put that in prespective, that is equal to watching four hours of TV per day for a touch over 41 years.

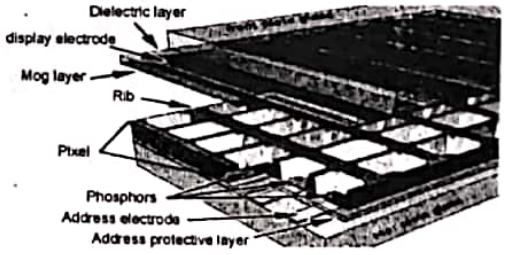


Fig. Structure of Plasma display

The other problem that plasma TVs can have a burn-in. This is the same problem that existed with the old CRT technology. Since phosphors are used in plasma TVs, just as they were in CRTs, a static video image can cause a semi-permanent shadow to stay on the screen. Manufactuers have developed several technologies to deal with this risk, reducing the possibility of burn-in. Should a plasma TV still get brun-in, the burn-in can be eliminated by leaving a solid, medium-gray image on the screen for about 15 minutes.

Q.9.(b) Discuss contruction and working of FAX. (8)

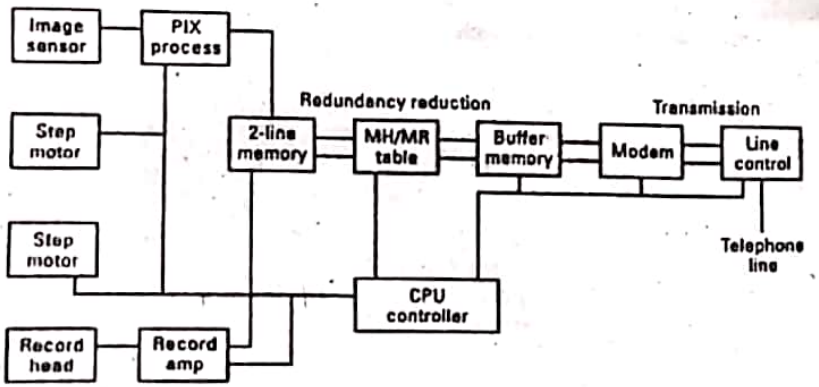
Ans. The way that a fax machine works is very simple. You dial a number, place the page you want to send in the machine, press "start", and off they go, at about less than a minute a page. However, if you want to know more, the following will provide you more details.

A fax machine scans an image by reading a very small area of the image at a time. It is like human eyes scanning across a page when reading, but only done electronically and much faster than most people do. It does not recognize the printed letters but reads the small black dots that form each character.

The machine decides whether the area it is reading is light or dark and assigns the area a number such as "0" for white and "1" for dark. It then transmits the number to a remote facismile receiver via telephone lines. The receiver makes a mark on paper corresponding to the area on the original image. This process continues as the transmitting machine scans a series of small areas horizontally across the image, and transmits that information to the remote receiver. The transmitting fax then scans the next lower line and so on until the entire image has been scanned, digitized, and transmitted. One full line of text usually takes 10 to 20 additional scanning lines. A whole page usually comprises 22000 scanning lines at fine resolution.

A typical Group 3 fax machine is shown as a block diagram as given below:

The technique to bring this process about uses as electronic eye to convert the image on the page into electrical signals. Tones are produced by a moderm to sent the information over a telephone fine. The modem then takes a group of 16 successive digital numbers and sends only one symbol to the fax receiver to achieve faster transmission. The symbols follow each other 2400 times a second as a signal. If you listen to a telephone while the fax is transmitting an image, you would hear a hissing sound that is similar to the noise produced by an AM radio tuned between stations. At the fax receiver, the transmitter processes are reversed and each digital number is transformed into a string of dots.



After the dots reach across the entire page, a line is printed. There are five different ways to print the received fax depending on the type of machine you are using. They are : Thermal paper–used since 1980, coated with chemicals that react to heat by turning black; Thermal film-contains ink that melts onto paper heated; Inkjet–same technique as an inkjet printer; Laser printer–same mechanism as a laser printer; Computer printer–after data received by a fax modem, it's stored on the computer's hard disk as a graphics file then printer out via computer's usual printer.

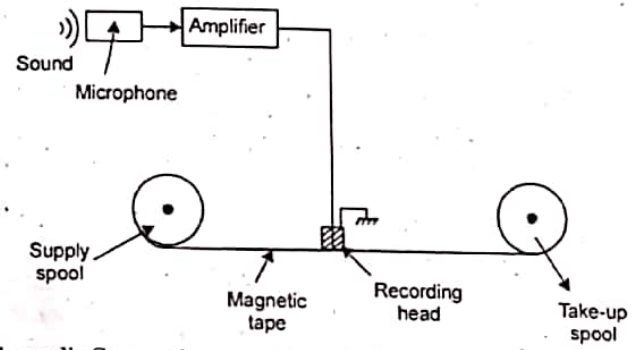
FIRST TERM EXAMINATION [FEB. 2017]
EIGHTH SEMESTER [B.TECH.]
CONSUMER ELECTRONICS (ETEC–408)

Time 1½ hrs. **M.M. : 30**

Note: Q. No. 1 is compulsory. Attmept any two more Questions from the rest.

Q.1. (a) Differentiate between the recording on the tape and disc. **(2.5*4) Marks**

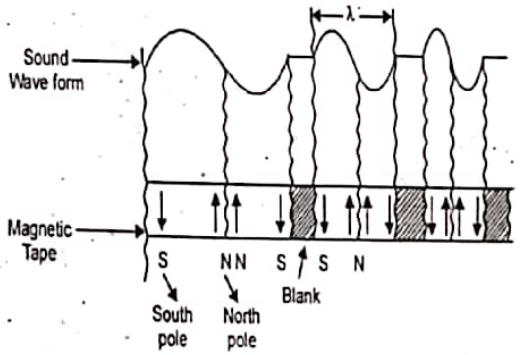
Ans. Magnetic tape is made up of soft magnetic material which can be mapnetised by the recording head as shown.



When the audio Current is passed through the recording head coil a charging flux x is produced.

When this flux touches the magnetic tape then the domains on the tape are disturbed.

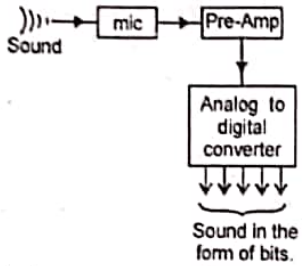
There is an air gap on the recording head from where the flux leaks and passes through the tape. The manetisation of three audio cycles is shown as follow:



Here

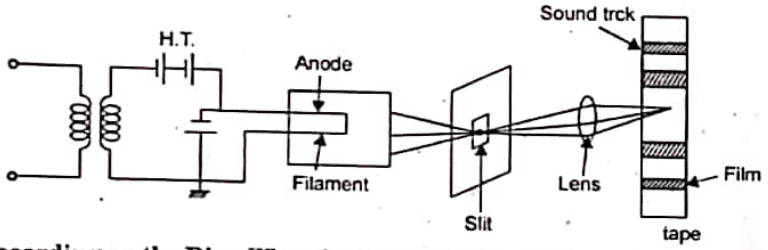
λ = recording wavelength
$= s/f$
s = speed of tape in cm/sec
f = frequency of audio signal in Hz.

Digital Recording of Sound: Digital version of sound comes in the form of 0's and 1's for this purpose sound is digitised by using Analog to Digital convertor as shown below:



This sound can be recorded mainetically on the tape by using recording head when '1' comes then current flows to the head coil and magnetic domains are formed on the tape but when '0' comes then because of no current-, the tape is left unmagnetised.

Sound can also be recorded by optical means. Here the tape is coated with the photo sensitive material. As the light falls over the tape film the image is recorded in the form of bars of varying density and distance on the film as shown in following figure.

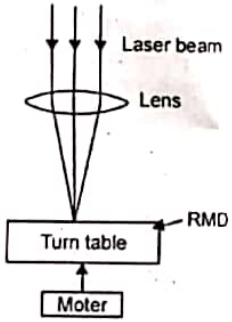


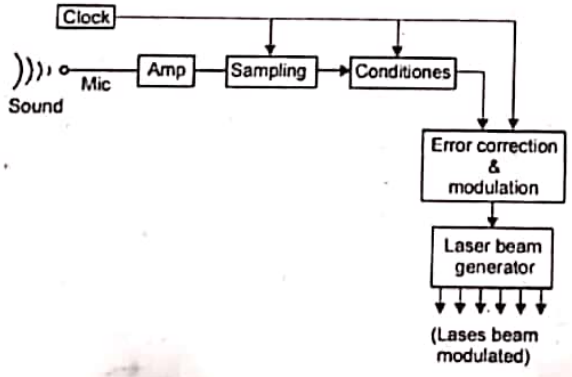
Recording on the Disc: When the digital dats is recorded on the disc, there is formation of flat and pit.

Pits are in the range of 1 μm depth and 0.5 μm width but are of variable length.

Seperation between the adjacent track is about 1.6 μm. Recording is done on a resist master disc (RMD) with the help of power ful laser beam.

The laser beam is modulated by digitised audio signal. The audio signal is sampled at the rate of 44.1 KHz. The quantom level pertains to 16 bits. Thus the bits per second are 705.600. To these bits some bits are added for correction. Controlling be modulating the signal.





When Laser beam is ON, a pit is formed and when off a flat is formed.

The digital signal is so encoded that when ever a '1' appears in the signal it causes transition from 'ON' to off and off to ON.

The process of recording of sound by optical means and in digital format is shown with the help of the following block diagram.

Q.1. (*b*) What do you mean by persistence of vision? **(2.5)**

Ans. Refer Q.1. (a) First Term Examination, 2016.

Q.1. (*c*) Explain the following in terms of microphone : Sensitivity, Directivity, SNR. **(2.5)**

Ans. 1) Sensitivity: It is output in milli: volt for a sound pressure of 0.1 Pa (or 0.5 $\times 10^{-4}$ W/m^2) at 1000 Hz.

Many times sensitivty is expressed in dB below 1V.

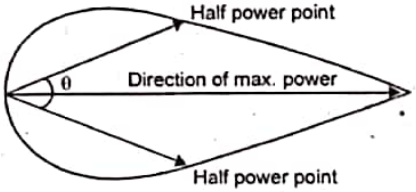
2. Directivity : The response/sensitivty of a a phone is different for the sounds coming from different directions. This effect is known as directivity. A uphone may be **unidirectional** (*i.e.*, pick up sound from 1 direction only) bidirectional (pick up sounds from directions).

or Omidirectional (pick up sounds from all directions.)

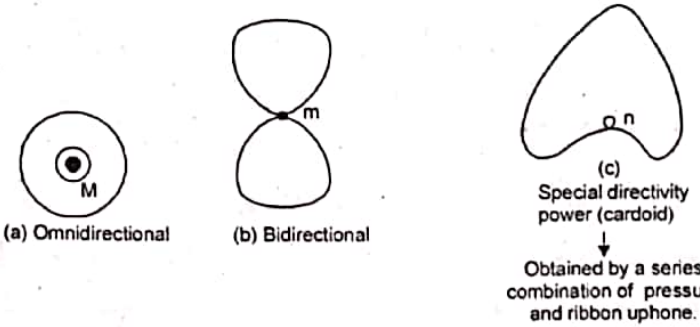
Fig. 1. Below is used to define Directivity in terms of angle θ which is the angle between half power points.

$$\text{Directivity} = 20 \log D, \text{ where } D$$

$$D = \frac{\text{Actual Output in the Direction of Max. Output}}{\text{Output in that direction for an omindirectional microphone}}$$



Directivity Patterns: Also known as polar curves (m) of a phone.

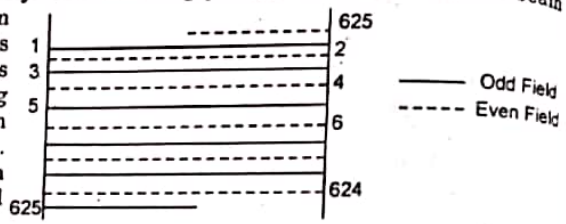


SNR: It is the signal to noise ratio, e.g the ratio of the output signal (v) when voice signal is fed under no noise condition to the output voltage when no voice is fed to the microphone.

Under the 2nd case only noise voltage comes and in 1st case the voltage output is purely due to signal only.

Q.1. (d) Explain any two : (i) Interlaced scanning (ii) Woofer (iii) Hi-Fi system. (2.5)

Ans. (i) Interlaced Scanning : When a scene is to be televised, two scanning processes occur simultaneously. One scanning process moves the electron beam horizonatlly at a fast rate from left to right, and the other moves the beam vertically downwards at a slower rate. The scanning speed is constant during both forward and downward scans. Thus the scanning is linear in both horizontal and vertical directions.

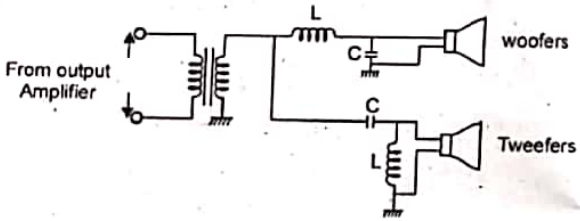


The complete picture is caued a frame. Each frame is scanned 50 times. Moreover each frame is divided into 625 lines in India. Thus the horizontal line scanning frequency is 625 × 50 Hz = 31250 Hz. the present day scanning method is called Interlaced scanning. in this process the 625 lines on a frame are divided into two sets of 312.5 lines each called first (or Odd) field and second (or Even) field. the lines in the odd fixed are scanned first. Half way through the 625th lines the spot returns to the top of the frame and the remaining 312.5 lines of even field are scanned. Then the odd field in scanned again followed by second scanning of even field. Thus each of the odd and even fields in scanned 25 times alternatively one after the other.

(ii) Woofer

Woofers and Tweeters are used to improve the frequency response of the system and improve the voice quality at the output.

Woofers are used to improve the low frequency response of voice and an basically low pass filters.



(iii) Hi – Fi system

High fidelity means faithfulness in the audio system it mean the 'originality' in the reproduced round. Ideal fidelity should have the following characteristics:

1. Complete exclusion of noise from the sound this means S/N ratio should be infinite.
2. No frequency distortion and flat frequency response from 16 Hz to 20 KHz
3. Non linear distortion should be nil.
4. High dynamic says from odB to 130 dB signal power.
5. Ability to give sense of direction.
6. Environmental conditions should be simulated linere the sound is being reproduced.

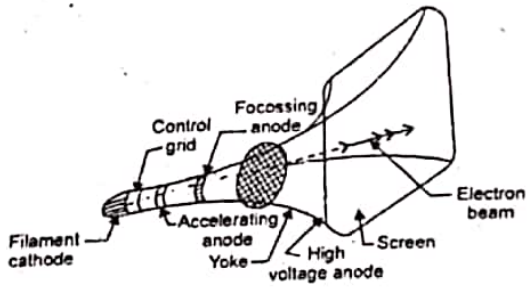
Q.2. Describe construction and working of monochrome picture tube. (10) Marks

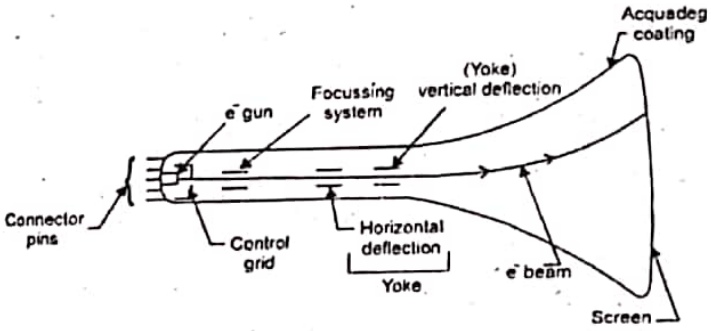
Ans. Monochrome Picture Tube: As the name suggest, this type of picture tube is used to show the pictures in black & white shades.

There are different type of circuit & sections in this picture tube

(1) Power supply section

(2) Deflection section → Horizontal, Vertical





e-beam generates from the gun & is controlled by grid after it is accelerated by the pre-accelerated anode & then is focussed by electrostatic lens action.

& then again it is accelerated. It is deflected in different direction on the screen by the deflection yoke.

A high speed e–beam can produce secondary electrons which may cause malfunctioning. So to remove them aquadage coating is used.

Q.3. (a) Explain the construction of moving coil microphone. (5)

Ans. Principle : A moving coil microphone works on the principle of induced emf (Faraday's law of electro magnetic Induction). The variations of sound pressure cause the motion of a coil in a magnetic filed. Thus an emf is induced in the moving coil. It is also known as a dynamic microphone.

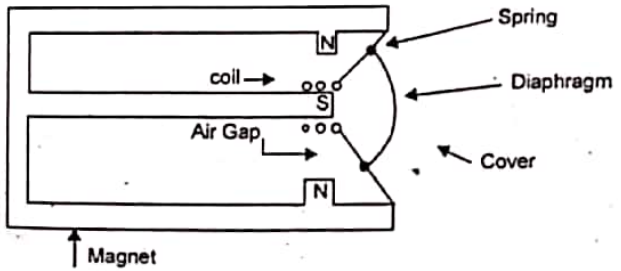


Fig. Moving Coil Microphone

Construction : it consists of a permanent magnet, generally POT type with a central south pole and peripheral North pole. The magnet is so shaped as to give a uniform field in the air gap. A diaphragm made of non-magnetic material is fixed to the body by springs. A coil wound on card board cylinder is attached to the diaphragm and

is free to move in the air gap, as the diaphragm vibrates due to sound waves. A protective cover saves the delicate diaphragm and other parts form mechanical damage.

Working : When sound waves strike the diaphragm, it moves foward and backwards. The coil also moves along with diaphragm and an emf is induced in the coil. The magnitude of emf is given by.

$$\boxed{e = Blv}$$

where $e \rightarrow$ emf, Volt

$B \rightarrow$ Flux density, wb/m^2 or T

$l \rightarrow$ length of conductor or coil, m

$v \rightarrow$ Velocity of coil, m/sec.

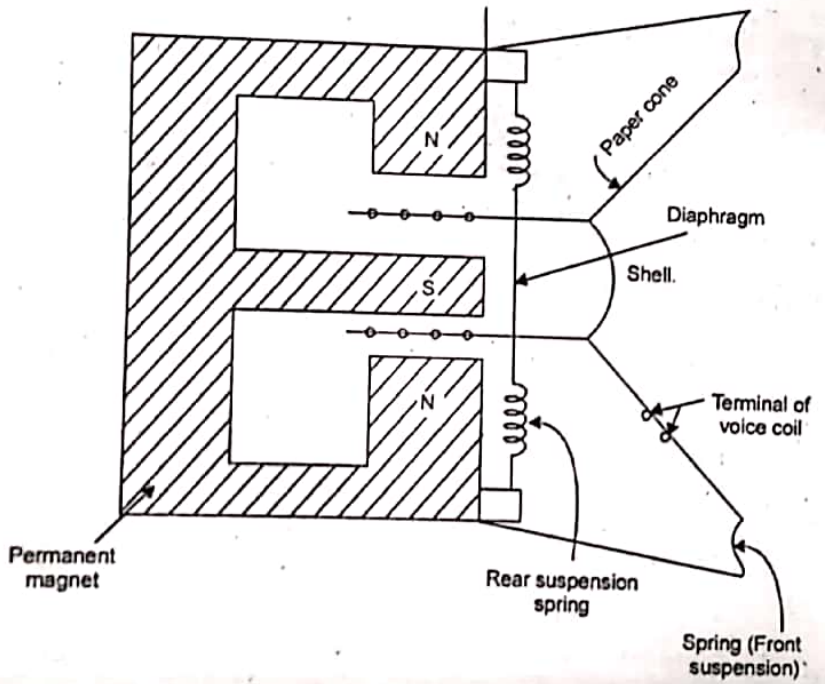
Since the emf is propertional to velocity of coil, it is designated as velocity microphone. The motion of coil depends on pressure of sound waves. Therefore it is pressure microphone.

Q.3. (*b*) Describe construction and working of a direct radiating type loudspeaker. (5)

Ans. Moving Coil cone type loudspeaker or direct radiating type loudspeaker.

The works over the same principle as that of AC motor, e.g. when a current carrying coil is placed inside the magnetic field then force acts upon the coil and coil attached to the diaphragm starts vibrating.

This current is equivalent to the sound pressure variation and is called as audio current.



Construction of this type of loudspeaker consist of a voice coil wound on a cardboard or fiber cylinder.

Audio current is feed to it through two terminals. This coil is placed in the magnetic field.

When the audio current (i) Changing according the voice, flows through the coil, a changing flux is generated. This changing flux interacts with the magnetic flux of permanent magnet. Because of this process a force (f) is generated on the diagram and by this diafragm starts vibrating and cause the sound production.

The force produced inside the coil is given by

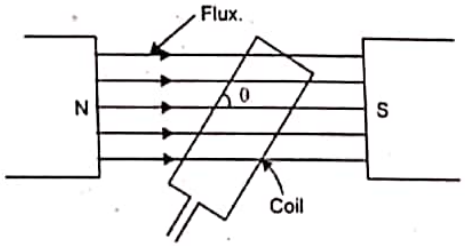
f = Bil sinθ

B = Magnetic flux density

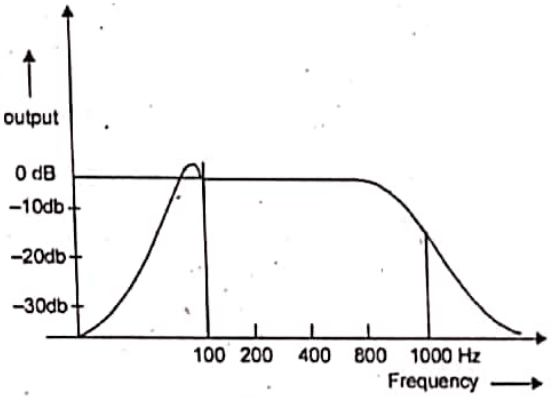
l = length of coil

i = Current flowing in the coil

θ = angle between the coil and magnetic field.



Frequency Response: This type of loud speaker is having following chracteristics:



Response of 20 cm cone type loudspeaker

Features of direct radiating type loudspeaker.

1. Efficiency: This type of loudspeaker is having a very poor efficiency about 5 percent only.

2. Signal to Noise Ratio: It is around 30 dB or more.

3. Frequency Response: Frequency response of typical speaker is from 200 Hz to about 5000 Hz, within these frequencies, the response is almost flat.

4. Distortion: It is about 10%

5. Directivity: It is generally omnidisectional in nature but it can be improved by using baffles and enclosures.

6. Impedance: These loudspeakers are available from 2Ω to 32Ω.

Q.4. Explain the Following :

Q.4.(a) Videocon Camera tube (10)

Ans. A TV camera tube converts the optical image into electrical signals by using a photo-sensitive surface. Videocon, Plumbicon, Saticon, Newvideocon are some commonly used camera tubes.

Construction:

The main parts of a vidicon camera tube are:

(1) Indirectly heated cathode (electron gun).

(2) Grids G_1, G_2, G_3 and G_4.

(3) Face plate made of optically feat glass.

(4) Target plate having two sides. The side facing the light is known as signal plate. It has a thin coating of Tin oxide (SnO_2) which is transparent to light and is a good conductor of electricity. A conducting metal ring surrounding the tube serves as electrical connection. The voltage given is 10 v to 40 v. The back side of target plate faces the elctron gun and has a coating of antimony trisulphide which is a semi-conductor.

(5) Defrection coils which also the e-beam to such the target horizontally and vertically.

(6) Focus coils, mounted outside the tube, to sharpen the e⁻beam.

(7) Alignment coil to keep the beam aligned to the axis of tube when there is no deflection.

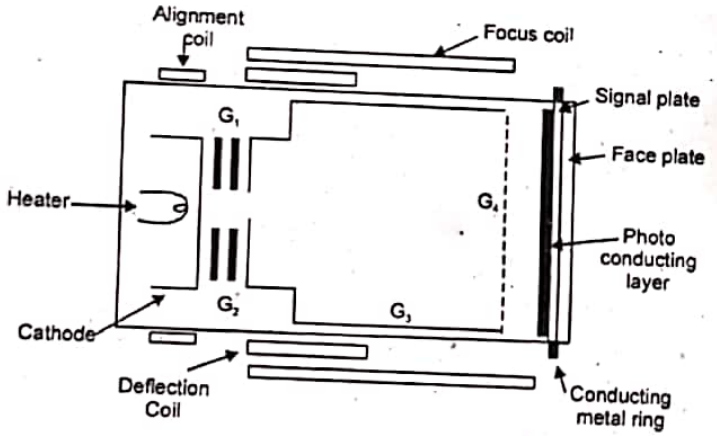


Fig. Videocon camera tube

Working : The indirectly heated cathode (e⁻gun) produces the scanning e⁻beam. The focus and deflection coils, directs the beam to hit and scan the target containing photo-conductive layer. The grid G_1 controls the beam current and grid G_2 accelerates the e⁻Focus grid G_3 slows down the e⁻so that the beam should fall perpendicularly on the target at a low speed without causing secondary emission. G_4 is a wire mesh and works as a muzzle of the e⁻gun.

The photo conductive material on the target plate has a very high resistance (about 20 $m\ \Omega$) in darkness as illumination increases the resistance decreases. Each pixel capacitor. When the target is scanned these pixel capacitors get charged by e⁻beam. Each element of the target plate is scanned every 40ms. Therefore free e⁻are added for 40 ms at that spot. this storage action increases, the sensitivity of the vidicon tube.

Q.4. (b) Negative Modulation

Ans. In negative modulation, the instantaneous amplitude of the carrier decreases with increase in instantaneous amplitude of the signal. The resulting modulated wave has white level at lower side, black levels at higher level. So, whenever, noise occurs, due to increase in amplitude, the level goes towards less brightness level i.e., gray or black. Thus, the effect of noise is minimized.

In addition to reduced effect of noise in negative modulation, there are many other advantages.

Advantages of negative modulation over positive modulation:

(a) RF noise pulses will not cause adverse effect on picture.

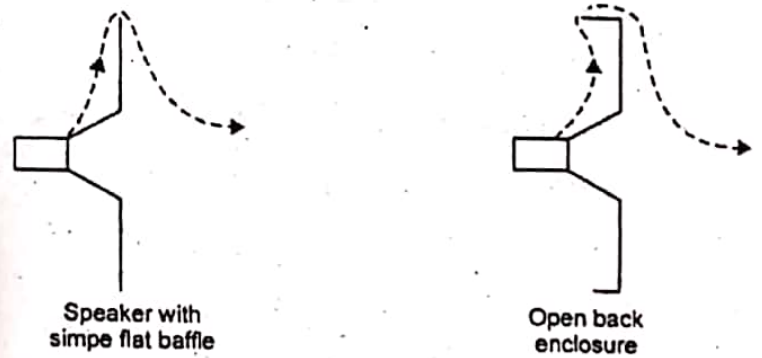
(b) Greater peak transmitter power can be possible.

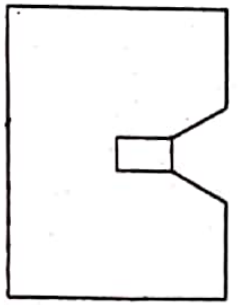
(c) AGC circuit will have stable level as reference.

Thus, negative modulation is preferred in TV broadcasting. Output frame camera tube (video signal) when it reaches the modulator, the polarity reversal is done so that black level is at 72.5 % and white level is at 12.5%. Thus, negative modulation takes place. However, strong noise pulses may cause false triggering of deflection oscillator being mistaken as sync pulses.

Q.4. (c) Baffles and Enclosures

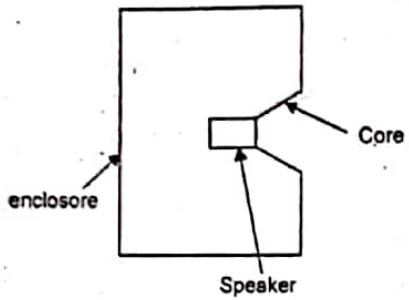
Ans. Baffles: Idealy speaking these are having infinite size of cone as shown below.



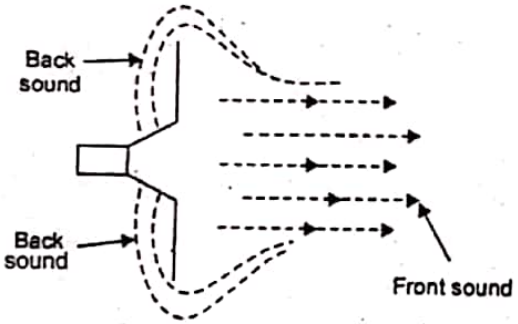


Closed back enclosure

Enclosure: These are type of baffles which completely encloses the speaker from the block side as shown.



Difference: baffles provide path difference and hence delay between the front sound and back sound which is 180° out of phase.



So that there is minimum distortion caused by the back sound to the front sound.

While the enclosres are those physical structures which does not allow the back sound to pass towards the front side of speaker.

END TERM EXAMINATION [MAY-JUNE 2017]
EIGHTH SEMESTER [B.TECH.]
CONSUMER ELECTRONICS [ETEC–406]

Time : 3 hrs. **M.M. : 75**

Note: Attmept any five questions including Q no. 1 which is compulsory. Select one question from each unit.

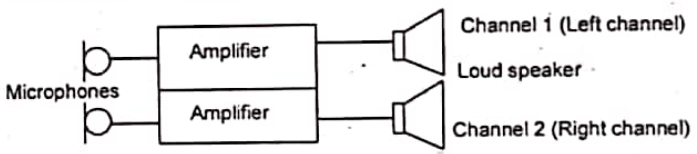
Q.1. (a) Why sound signal is frequency modulated and picture signal is amplitude modulated in T.V. **(5)**

Ans. Refer Q.1. (c) First Term Examination 2016.

Q.1. (b) Define dynamic range and stereophonic effect. How dynamic range is improved. **(5)**

Ans. Dynamic Range : Hi - Fi systems are designed to handle very high intensity sounds. The term dynamic range is used to specify this characteristic. Dynamic range is the dB ratio of the sounds with highest and lowest intensities to which the system can respond. A Hi - Fi system should have a dynamic range of 80 dB or more. Many times the pop music has an intensity level of more than 100 dB over the threshold of hearing.

Stereophonic Effect : The word stereo means solid. A stereo sound system means solid system. The word solid means 3-D space. thus a stereo system is one which produces 3-D effect. When a programme is being recorded different sources of sound are located at different positions around the singer. when such a programme is played back it would appear original only if sound reaches the listenes ears from more than one direction. This is the stereo effect.



The concept of stereophony evolved due to the reason that the sounds reaching our two ears have minute differences and our ears have the capability to judge the direction of sound very minutely.

Q.1.(c) What are the essential requirement of a Hi - Fi systems? **(5)**

Ans. Requirement of Hi-Fi System:

For a system to be hi-fi, the following requirements should be met:

1. Signal to noise ratio should be better then 50 dB.
2. Frequency response should be flat within ± 1 dB; over the frequency range of 40 Hz to 1500 Hz.
3. Non linear distortion should not be more than 1%.
4. The system should have dynamic range of at least 80 dB (20 dB whisper to 100 dB loud pop-masic over the threshold of housing).
5. Stereophonic effect should be produce in the output sound.
6. Environment should be maintained in sure a manner so at to give a very pleasant sound to listen, which eliminates the external noise in the listening area.

Q.1.(d) Explain how noise and distortion can be reduced in tape recorders. **(5)**

Ans. If the type speed in case casette player is not steady and varies a distortion called wow and flutter is produced.

Wow is generally caused by buckled type spool or an off centre gramophone record.

This can easily be detected on sustained note of piano or organ ornameats.

When variation of speed is more than 6Hz (Upto absent 100 Hz) the variation in the pitch is called flutter.

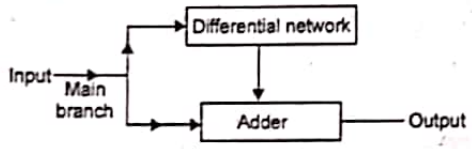
Romble: It is the low frequency distortion caused by mechanical vibrations of motor body or capston.

Motor vibrations are prevented by using mechanical filters (vibration absorbers)

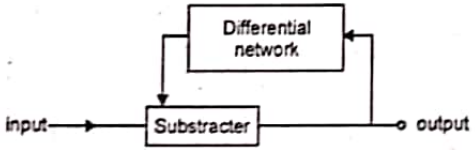
Ruble is expressed in dB. The machine can be said to be almost silent if rumble is 45 dB with respect to sound pressure level (SPL) of 1 μ bar.

Hissing Noise: This type of noise is present in all type of tape recorders due to irregolarities in the tape coating. The hissing noise becomes comparable to the soft notes and hence is most perceptible during soft silent passeges in music.

Stereo system gives a faithful sound production which produces more realistic sound by giving a right sense of direction.



Coding of signal in Dolby method



Dr. Ray Dolby introduced a novel system for improvement in noise reduction techniques. By this method improvement can be achieved upto 10 to 15 dB.

Dolby A System:

Boosing is done in four bands.

(*i*) Below 80 Hz

(*ii*) 80 Hz to 2999 Hz

(*iii*) 3000 Hz to 9000 Hz

(*iv*) 9000 Hz and above.

Each band is processed seperately by using low pass, band pass and high pass filters and limiters, because of this signal to noise ratio is improved.

The output of the four separate units is added. This is done in a single branch. This branch is know as differential network, the output of differential network goes to adder of the adder of main branch.

Q.1. (e) Explain the compatibility of color TV system with monochrome system. **(5)**

Ans. There are the following requirement of compatibility of colour TV with that of the monochrome TV.

1. It should occopy the some bandwidth as that of monochrome TV signal.
2. The location and spacing of picture and sound carries should remain the same.
3. The lominance of colour video signal should remain same as that of monochrome signal.
4. Colour signal should be in the form of ancillary signals.
5. Colour information should be sent in the form such that it does not effect the display on the monochrome receiver.
6. System should employ the same deflection frequency and syne signals.

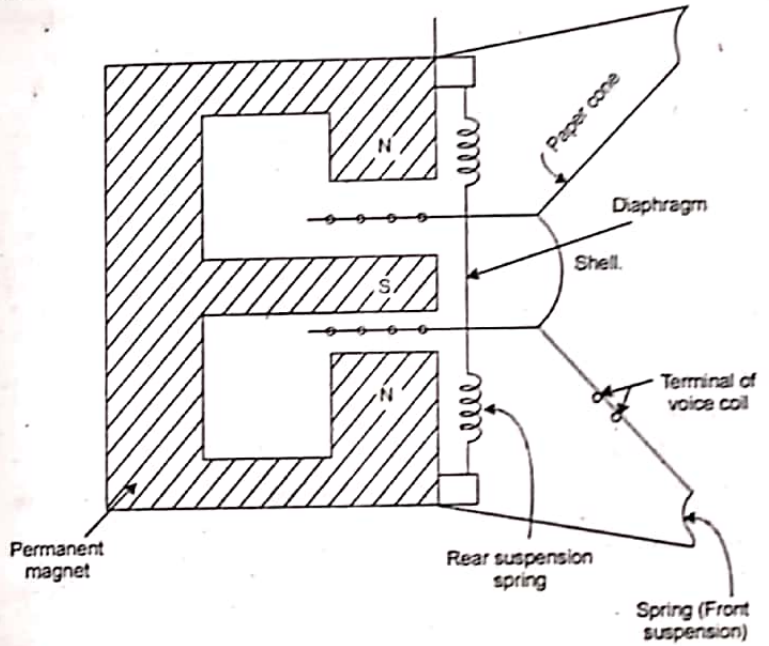
UNIT–I

Q.2. (a) Explain in detail the working of a permanent magnet loudspeaker. **(6.5)**

Ans. Moving Coil cone type loudspeaker or direct radiating type loudspeaker.

The works over the same principle as that of AC motor, e.g. when a current carrying coil is placed inside the magnetic field then force acts upon the coil and coil attached to the diaphragm starts vibrating.

This current is equivalent to the sound pressure variation and is called as audio current.



Construction of this type of loudspeaker consist of a voice coil wound on a cardboard or fiber cylinder.

Audio current is feed to it through two terminals. This coil is placed in the magnetic field.

When the audio current (*i*) Changing according the voice, flows through the coil, a changing flux is generated. This changing flux interacts with the magnetic flux of permanent magnet. Because of this process a force (*f*) is generated on the diagram and by this diafragm starts vibrating and cause the sound production.

The force produced inside the coil is given by

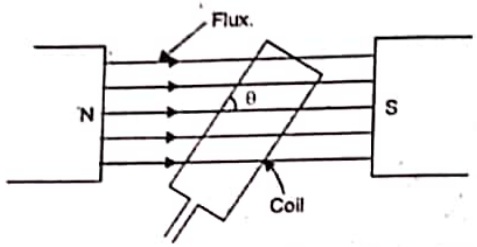
f = Bil sinθ

B = Magnetic flux density

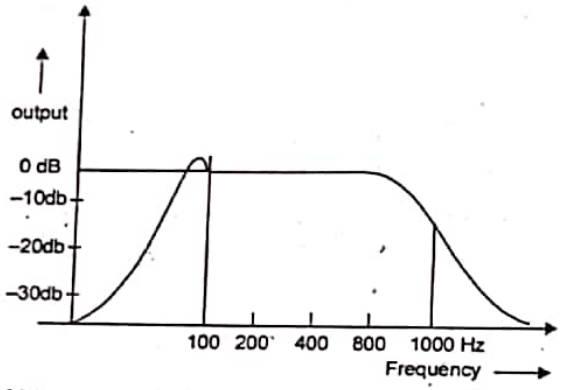
l = length of coil

i = Current flowing in the coil

0 = angle between the coil and magnetic field.



Frequency Response: This type of loud speaker is having following chracteristics



Response of 20 cm cone type loudspeaker

Features of direct radiating type loudspeaker.

1. Efficiency: This type of loudspeaker is having a very poor efficiency about 5 percent only.

2. Signal to Noise Ratio: It is around 30 dB or more.

3. Frequency Response: Frequency response of typical speaker is from 200 Hz to

4. Distortion: It is about 10%

5. Directivity: It is generally omnidisectional in nature but it can be improved by using baffles and enclosures.

6. Impedance: These loudspeakers are available from 2Ω to 32Ω.

Q.2.(*b*) If the gup width is 0.0254 mm and the tape speed is 25.4 cm/s. Find the maximum usable frequency. **(6)**

Ans.

$$fm = \frac{s}{2G}$$

where $fm \rightarrow$ Maximum usable frequency

$G \rightarrow$ Air Gap

$S \rightarrow$ Tape speed.

$G = 0.0254$ mm $= 0.00254$ cm

$S = 25.4$ cm/sec

$$fm = \frac{25.4}{2 \times 0.00254} = \frac{25.4}{0.00508} = 5000 \text{ Hz} = 5\text{KHz}$$

Q.3. (*a*) How many types of equalizers are there? Explain briefly. **(6)**

Ans. Equalization is a process of adjusting the balance between the frequency components inside the signal. Adjusting the balance means boosting or weakening the signal strength in some of the bonds.

The most use of equalizers is there in the sound reproduction and recording.

Equalizers normally work on a group of frequencing called as bonds or frequency bonds. Analog equalizer most offenly come in form of graphic equalizers. A big board with lots of slider controls for individual bands.

There are the following type of equalizers:

1. Simple equalizer
2. Band equalizer
3. Harmonic equalizer

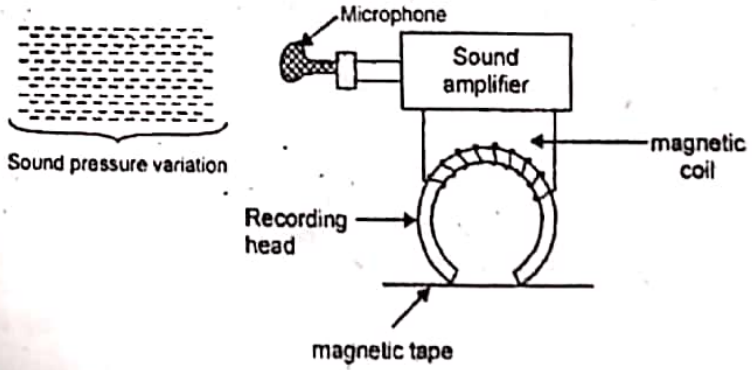
Band Equalizers: These equalizers control specific frequency bands and allow fine grained control over the gain (boost) or suppression (attenuation) within the bands. Gain/ Attenuation ranges will vary from + –6.dB to + –24 dB or even greater. The frequency bands cover the full audio range of 20 Hz to 20 KHz and are typically based on an Octave (9 to 11 bands), 2/3 octave (15 – 17 bands) and 1/3 octave (30 – 31 bands) being the most common. (Note: There are also 17–22 band equalizers which may be 1/2 octave or use frequency ranges defined by the supplier). With modern software 1/6, 1/12 and 1/24 octave or even higher equalizers are possible but require some serious thought about the user interface since a 1/24 octave equalizer covering the entire audible region would have more than 200 bands to control Equalizers that support bands lower than an Octave are frequently called **Fractional Octave Equalizers.** Most band equalizers label thierfrequency bands according to the ISO Preferred Freuquency standard (ISO 226 : 1997 or ANSI equivalent S1.6-1984) and use appropriate standard methods for calculation of band centers. The Preferred Frequency specification contains both a Preferred Frequency value and a Calculated Center value. Either may be used according to the desired accuracy.

Q.3. (*b*) Explain the principle of magnetic secondary of reproduction. What is the relation between gap size, tape speed and frequency of the audio signal? **(6.5)**

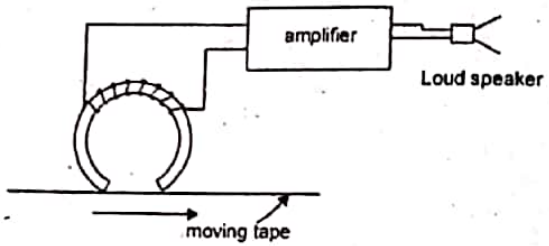
Ans. In the magnetic recording the information received from the microphone is in the form of Audio signal which is passed through the recording head and produces the varying magnetic field.

This variation of magnetic field strength disturb the magnetic domains on the magnetic tape.

And hence the information is stored permanently on the tape.



When the tape is moved under the playback head then the domains stored causes current to flow in the coil of head and is then amplified to produce the sound through Loud speaker.



Derivation for maximum usable frequency by tap-recorder/player system.

One cycle variation of audio covers a distance of λ on the tape

let time period = T

in T seconds distance coveled = λ

in 1 second distance covered = λ/T

Which is also call as speed (S)

$$\Rightarrow \quad S = \lambda/T$$

Let $$\frac{1}{T} = fm$$

$$\Rightarrow \quad fm = s/\lambda \qquad ...(1)$$

For better reproduction G (gap width of head)

$$= \lambda/2$$

or $$G = \lambda/2$$

$$\Rightarrow \quad \lambda = 2G \qquad ...(ii)$$

Putting (*ii*) in (*i*) we get:

$$\boxed{fm = \frac{s}{2G}}$$

UNIT–II

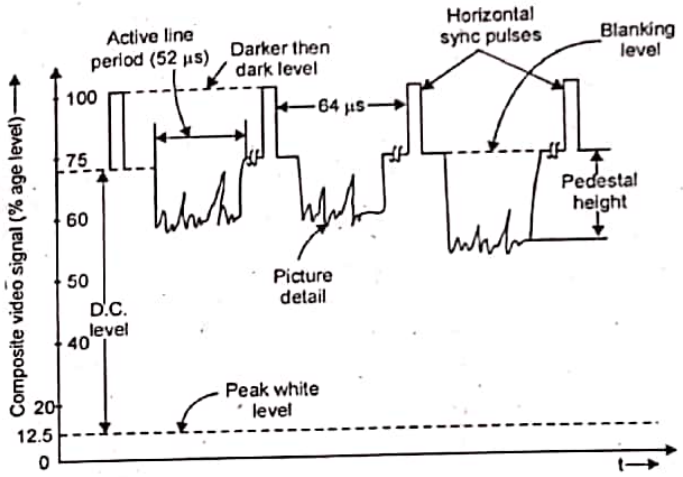
Q.4. (*a*) Sketch composite video signal for at least two successive cycles and explain (*i*) Extreme white level (*ii*) Pedestal Height (*iii*) Blanking level. (6.5)

Ans. Composite video signal consist of a camera signal corresponding to the desired picture information blanking pulses and syndronization pulses to synchronise the scanning process at receiver and transmitter.

Horizontal sync pulse is required at the end of each active line period. While the vertical sync pulse is required when each field is scanned. Different levels of composite video signal are given as follow:

Extreme White Level: This levels starts approximately from 12.5% as shown in the figure. Lowest 10% of voltage range which is called as whiter than white level is not used to minimize the noise effect.

There will not be any amplitude distortion if any pulse occurs having a level below 12.5%.



Blanking level: It is that level at which blanking pulse accurs. These are used during scanning process & retrace duration. This should be invisible since the retrace of electron beam will cause disturbance. So its level is kept on the darker side of 75%.

The repetition rate of horizontal balanking pulse depends on the tracing and retacing cycles.

(*b*) Explain the working of Videocon camera tube with neat diagram (6)

Ans. Refer Q.4. (a) First Term Exam. 2017.

Q.5. Sketch details of horizontal blanking and sync. pulses? Label on it (*i*) front porch (*ii*) back porch (*iii*) horizontal sync. pulses (*iv*) Active line periods. Explain all. (12.5)

Ans. The horizontal blanking period and sync pulse details are illustrated in fig. The interval between horizontal scanning lines is indicated by 'H'. Out of a total line period of 64 µs, the line blanking period is 12 µs. During this interval a line synchorinizing pulse is inserted. The pulses corresponding to diffrentiated leading edges of the sync pulses are actually used to synchronize the horizontal scanning oscillator.

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

Details of Horizontal Scanning

Period	Time (µs)
Total line (H)	64
Horz blanking	12 ± 0.3
Hor sync pulse	4.7 ± 0.2
Front porch	1.5 ± 0.3
Back porch	5.8 ± 0.3
Visible line time	52

Front porch: This is a brief cushioning period of 1.5 µs inserted between the end of the picture details for that line and the leading edge of the line sync pulse. This interval allows the receiver video circuit to settle down from whatever picture voltage level exists at the end of the picture line to the blanking level before the sync pulse occurs.

Thus sync circuits at the receiver are isolated from the influence of end of the line picture details. The most stringent demand is made on the video circuits when peak white occurs at the end of a line.

Line sync Pulse: After the front porch of blanking, horizontal retrace is produced when the sync pulse starts. The flyback is definitely blanked out because the sync level is blacker than black. Line sync pulses are separated at the receiver and utilized to keep the receiver line time base in precise synchronizm with the distant transmitter. The nominal time duration for the line sync pulse is 4.7 μs. During this period the beam on the raster almost completes its back stroke (retrace) and arrives at the extreme left end of the raster.

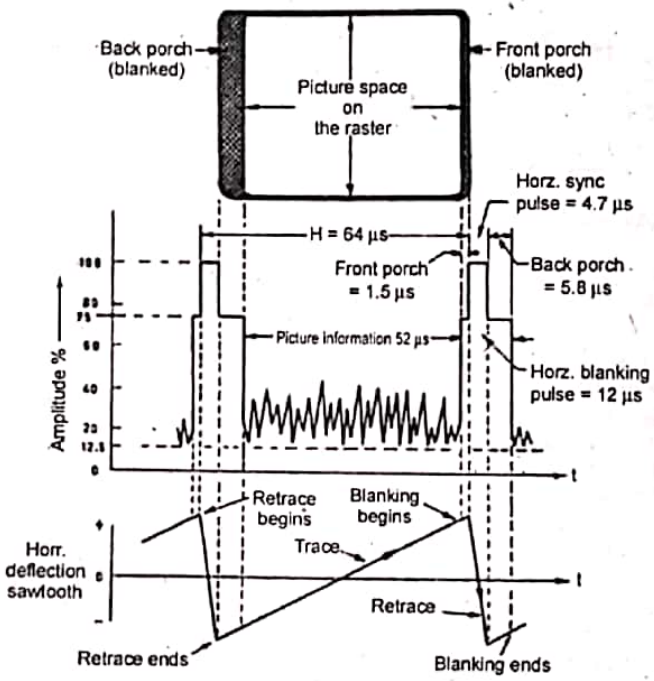


Fig. Horz. line and sync details compared to horizontal deflection sawtooth and picture space on the raster

Back Porch: This period of 5.8 μs at the blanking level allows plenty of time for flyback to be completed. It also permits time for the horizontal time, base circuit to reverse direction of current for initiation of the scanning of next line. In fact, the relative timings are so set that small black bars (see Fig.) are formed at both the ends of the raster in the horizontal plane. These blanked bars at the sides have no effect on the picture details reporduced during the active line period.

The back porch also provides necessary amplitude equal to the blanking level (reference level) and enables to preserve dc content of the picture information at the transmmitter. At the receiver this level which is independent of picture details is utilized in the AGC (automatic gain control) circuits to develop true AGC voltage proportional to the signal strength picked up at the antenna. As stated earlier colour burst in CTV is carried during back-porch intervals.

UNIT–III

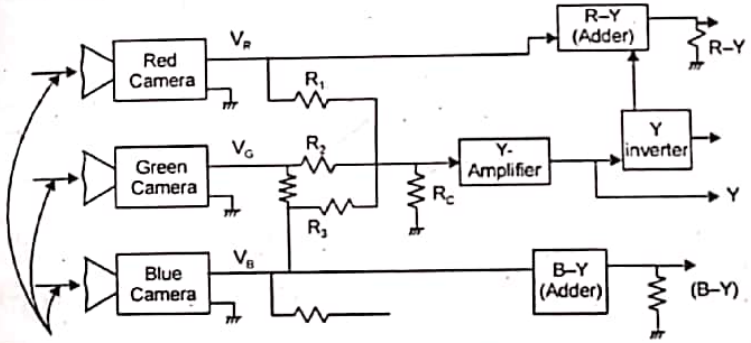
Q.6. (*a*) Explain how the luminance and colour difference signals are developed from camera outputs. Why is it necessary to set $Y = 0.3R + 0.59\,G + 0.11\,B$? (6.5)

Ans. When televising the colour scenes even when voltages R, G and B are not equal, Y signal will represent the monochrome equivalent of the colour because the propositions 0,3, 0.59 and 0.11 taken of R, G and B respectively still represent the contribution which red, green and blue light make to the luminance. This aspect can be illustrated by considering some specific colours.

For obtaining Y and colour difference signals following resistance matrix is used.

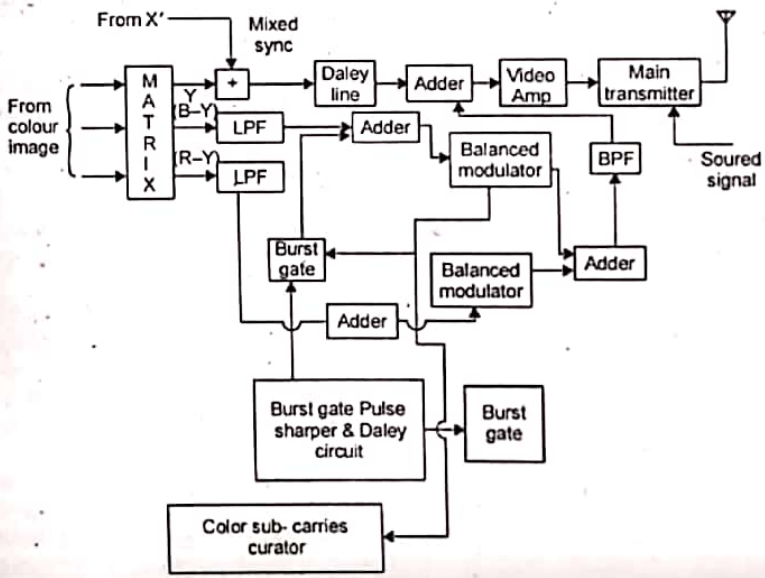
Colour light through diachroic mirrors

$$R-Y = 0.7\,R - 0.59G - 0.11\,B$$
$$B-Y = 0.89\,B - 0.59\,G - 0.3\,R$$
$$Y = 0.3\,R + 0.59\,G + 0.11\,B$$



Q.6. (*b*) Draw and explain block diagram of a PAL encoder. Explain how the composite colour signal is formed. (6)

Ans. The basic encoding process of PAL TV system is shown as follow:



The Gammacorrected R, G, and B are added to form the γ signal and weighte colour difference signals the bandwidth of both (β-Y) and (*R*–Y) video signals a restricted to about 13 MHz by appropriate low pass filters. In this process these signal suffer from a small delay relative to Y signal. In order to compensate for this delay, delay line is inserted in the path of Y signal.

The weighted colour difference signals are fed to the corresponding balance modulators on modulation both the clour difference quadratise signals are allowed th same bandwidth of about 1.3 MHz. This results in better colour reproduction. Howeve the chroms signal is of vestigial sideband type. The upper sideband attenuation slop starts at 0.57 MHz (5-4.43 = 0.57 MHz) but the lower side band extends to 1.3 MH before attenuation begins.

Q.7. Explain the construction and working principle of Trinitron and PI colour picture tubes. Compare their features. (12.5

Ans. Refer Q.6. (a) of End Term Exam. 2016.

UNIT–IV

Q.8. Using neat block diagrams, explain the working principle of

(*a*) LCD TV

(*b*) Plasma T.V.

Also explain the performance comparison of LCD and Plasma T.V. (12.5

Ans. (*a, b*) Refer Q.9. (a) of End Term Exam. 2016.

Q.9. (*a*) Explain the working principle of (*i*) Cable TV and (*ii*) DTH system using neat block diagram. (6.5

Ans. (*i*) Cable T.V.

Cable System: Edge provides event signals (programs) for all channels. Local broadcasting and a much captured by an antenna mounted on top of a very high tower in order to extend the distance limit of view. These signals can be distributed it as their home channels number.

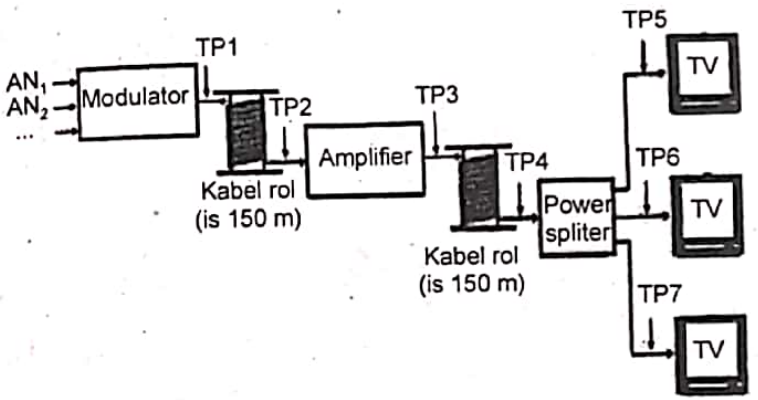
Distribution Cables: Frequency losses in coaxial cables is high, especially those working in the super frequency region from cable TV. However, loss-loss of channel offset by using a radio frequency amplifier with a wide field of frequencies that are placed along the cable network.

In distribution systems, main channel is the trunk. From this main line, branch cables extended to groups of customers. Channel for each customer referred to the drop

Each amplifier channel has a strengthening of the same trunk with a loss channel for the distance between the amplifier Typical value is 40 dB, or a strengthening of the voltage at 100.

Definition: Cable television is a television broadcasting system via radio frequency signals transmitted via fiber optic or coaxial cables are fixed and not through the air like a regular television broadcasts that must be capture dantenna (over-the-air). In addition to telvision, FM radio show, internet, and phones also can be delivered via cable. This system is often found in North America, Europe, Australia, East Asia, South America, and Middle East.

Cable television was less successful in Africa because of low population densities in various regions. Like radios, different frequencies are used to distribute many channels through one cable. A receiver box used to select a television channel. Modern cable systems now use digital technology to broadcast more channels than analoge system



How it works In a cable system, the signal may have exceeded 30 or 40 amplifiers before reaching your home, one for each 1000 feet or more, with each amplifier you can get noise and distortion. Pulse if one of the amplifiers fails you will lose the image. Posts cable systems do not have good image quality and can not be trusted. At the end of 1970, cable TV amplifiers find a solution to the problem. Since then they also make the technology they can add programming to cable service.

Adding channels In the early 1950s, cable systems began to experiment with how to use micro glom bang sender and receiver tower to catch signals from distant stations. In some cases, this way to make television available to the people who live touside the area of broadcast standards.

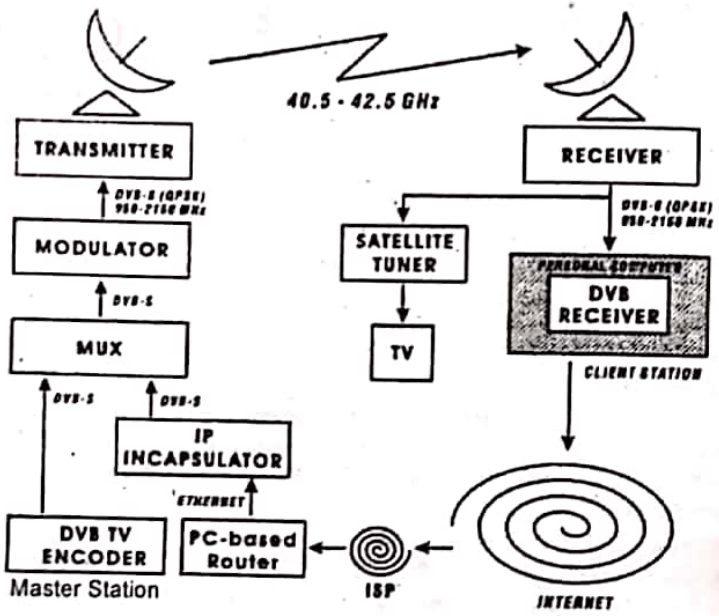
That means cable TV subscribers may be able to access to several broadcasting stations that have the same network. For the first time the TV cable is used to increase the spectacle, not only the usual spectacle. This started a trend that started the boom in its cable TV in the 1970s. The addition of the station CATV (Community Antenna Television) and cable distribution system directs the author to add a switch most of the television setting.

People can manage their television channels to choose on the basis of the frequency allocation plan of the Federal Communications Commission or they can set all to plan for the use by most cable systems. Two different plans its interests. In both search systems, each television station has provided six megahertz part of the radio spectrum. The FCC has become part of the spectrum of very high frequency (VHF) to 12 television channels.

(*ii*) DTH system

DTH (Direct To Home): In direct-to-home (DTH) telecast, TV channels/ programmers are directly distributed via satellite to the subscribers 'homes without the intervention of a cable operator. The signals are transmitted in Ku band (10.7 GHz to 18 GHz) and are received by the subscribers through a small dish antenna (about 45 cm in dia.) and a set-top box (or an integrated receiver decoder). The DTH system can also provide many value-added services such as the Internet, e-mail, data casting, e-commerce, and interective multimedia. It has the provision for a subscriber management system similar to the one for conditional access system (CAS). The current means of broadcasting in India don't provide quality reception in shadow areas, particularly in the north-eastern region. The DHT can fill this void easily. All in all, DTH offers immense opportunities to both the broadcasters.

Base station transmitter provides up-conversion of intermediate frequency to 40.5-42.5GHz and further beaming of RF signal through antenna with required directional pattern to client stations. The standard base station antenna directional pattern is 90 degree with optional 360 degree or other customized degree. Client station receiver ODU provides boosting/down-conversion of mm-wave signal to intermediate frequency for further use at client-side TV-tuner and LAN card.



Q.9. (*b*) Explain digital cellular phone with functionsl block diagram. (6)

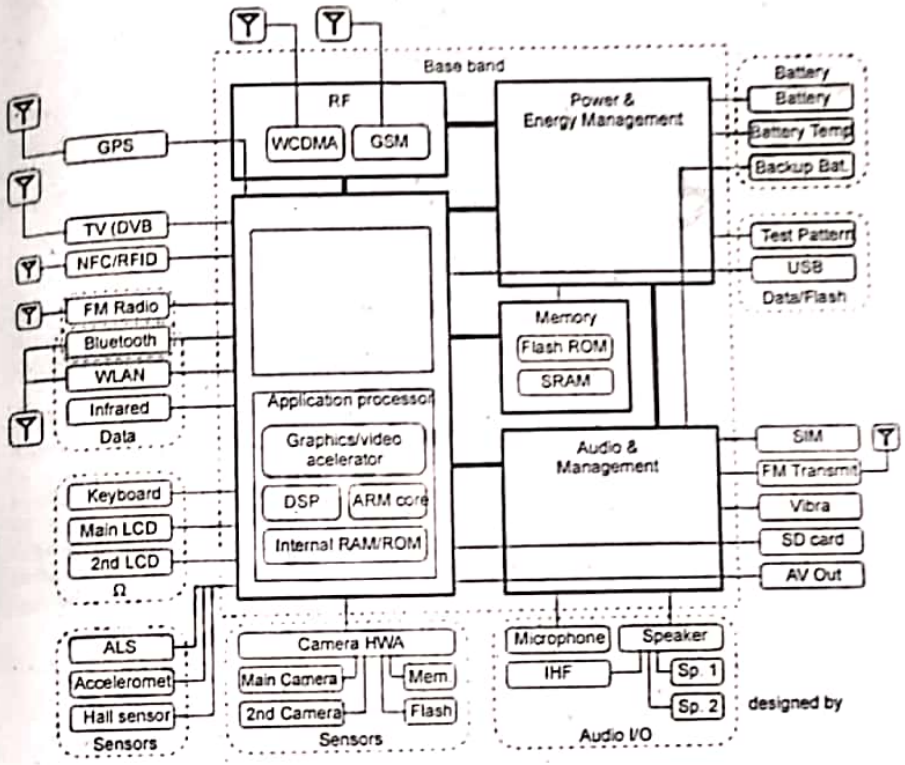
Ans. In this lesson we are going to take a brief familiarization of a typical block diagram of a cellphone.

Block Diagram can help us understand the flow of a certain part of a cellphone's circuit.

A Cell-phone handset is basically composed of two sections, which is RF and Baseband Sections.

RF

RF refers to radio frequency, the mode of communication for wireless technologies of all kinds, including cordless phones, radar, ham radio, GPS, and radio and television broadcasts. RF technology is so much a part of our lives we scarcely notice it for its ubiquity. From baby monitors to cell phones, Bluetooth→ to remote control toys, RF waves are all around us. RF waves are electromagnetic waves which propagate at the speed of light, or 186,000 miles per second (300,000 km/s). The frequencies of RF waves, however, are slower than those of visible light, making RF waves invisible to the human eye.



Baseband: In signal processing, baseband describes signals and systems whose range of frequencies is measured from zero to a maximum bandwidth or highest signal frequency. It is sometimes used as a noun for a band of frequencies starting at zero.

In telecommunications, it is the frequency range occupied by a message signal prior to modulation. It can be considered as a synonym to low-pass.

Baseband is also sometimes used as a general term for part of the physical components of a wireless communications product. Typically, it includes the control circuitry (microprocessor), the power supply, and amplifiers.

A baseband processor is an 1C that is mainly used in a mobile phone to process communication functions.

Basically Baseband also composed of to sections which is the Analog and Digital Processing Sections. So, we are going to separate each other for better and easier to understand.

Cell-phone have three different sections which is the following.

I prepare this to be simple and easy instead of using or explaining it with deep technical terms .

In this manner, it is easy for us to understand the concepts and methods of how basically the cellphone works.

Cell-phone have three sections since baseband is differentiated by into two which is the Analog and Digital function while the RF section remains as a whole circuit section., which is the following cosists.

1. Radio Frequency (RF Section)

2. The Analog Baseband Processor And the Digital Baseband Processor.

Frequency Processing Section

The RF section is the part of the cell-phone circuit is also known as RF Transceiver.

ft is the section that transmit and receive certain frequency to a network and synchronize to other phone.

The RF - A radio section is based on two main Circuits.

1 Transmitter

2 Reciever

A simple mobile phone uses these two circuits to correspond to another mobile phone. A Transmitter is a circuit or device which is used to transmit radio signals in the air.and a reciever is simply like radios which are used to recievetransmissions(Radiation) which is spread in the air by any transmitter on a specific frequency.

The two way communication is made possible by setting two transmitters and two recieverssycronized in this form that a trasmitter in a cell phone is syncronised with the frequency of other cell phone's recieving frequency same like the transmitter of second cell phone is syncronised with the recieving frequency of first cell phone. So first cell phone transmits its radiation in the air while the other phone listens it and same process is present in the opposit side, so these hand held two cell phones correspond to one another, the technology used in these days is a little bit different but it is based on the basic theory prescribed before, the today's technology will be discussed in later on.

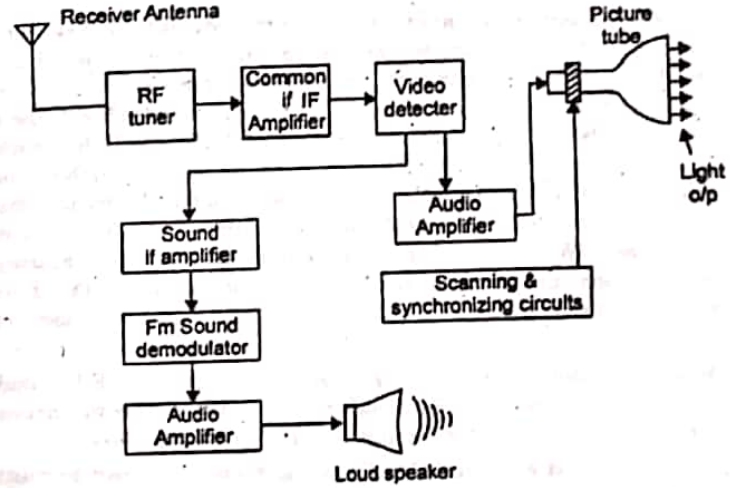
FIRST TERM EXAMINATION [FEB. 2018]
EIGHTH SEMESTER [B.TECH]
CONSUMER ELECTRONICS [ETEC–408]

Time : 1.5 hrs. **M.M. : 30**

Note: *Q. no. 1 is compulsory. Attempt any two more questions from the rest.*

Q.1.(a) Draw and explain the block diagram of a TV receiver : **(3)**

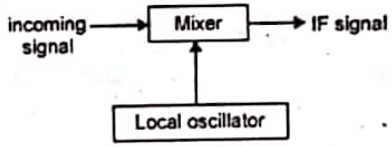
Ans. Basic block diagram of TV receiver is as follow:



Block Description: The receiving antenna converts the electromagnetic wave into the electrical signal into the some frequency.

The RF Tunes is used to tune/selects the particular channel from the pool of available channels.

If Amplifier stage amplifies the If signal generated from the mixes slope.



Local oscillater and RF Tunes are tuned of the same frequency.

Video detector is used to seperate the Sound Signal from the video signal. Picture signal after amplification is fed to the picture tube and Sound Signal is given to Sound Section, which is also the FM detector Stage. Since Sound is FM modulated.

Scanning and Synchronizing discrite are used to display the picture signal in synchronism with the signal transmitted and retracing pluses during the Scanning of picture frame.

Sound demodulater extracts the audio signal from the FM modulated wavefor
FM demodulater first converts the FM into AM signal and then AM is demodulate
using diode detection and filteration after FM demodulation, the extracted signal
amplified by push, pull amplification method and then fed to the loudspeaker
produce the sound wave.

(b) Differentiate between Woofers and Tweeters? (3

Ans. Refer Q.1.(d) End Term Examination 2016.

**(c) Why picture signal is Amplitude Modualated and sound system
Frequency Modulated in TV Transmission?** (4

Ans. FM modulation occupies a bandwith that is several times the highest frequenc
to be demodulated, and video has such high frequencies, this is way too much BW f
terrestial use. Satellite video is FM modulated, and the transponder BW is on the ord
of 30 MHz.

The main element to prevent interference to the video is the FM carrier level is onl
5 to 10 percent of the video carrier, even less in Cable systems where 1 to 2 percent
common. The FM uses filters to keep the video from being demodulated as sound. Howeve
when highly saturated yellow color is overmodulated, it encrouches on the audio and
heard as a raspy buzz. The Video luminencc is a 4.2 MHz signal, that is why the audi
subcarrier is at 4.5 MHz. If the carrier were to be AM modulated, that would occupy
bandwidth of 8.4 MHz. With TV channels allocated on 6 MHz spacing, this would no
fit. So the lower sideband is mostly eliminated leaving just 1.5 MHz as a vestige. Th
gives an occupied BW of 5.7 MHz for the video which does fit. As long as there's a carrie
diode detectors don't need both sidebands. When color was added, it's subcarrier at 3.5
MHz was done in such a way as to interleave with the visual, so it does not add to th
overall BW.

FM was the choice for audio mostly because its greater RF BW makes it mor
immune to noise on demodulation. Random noise in the picture was not considered t
be as serious a problem as the eye could 'average out' the sparkles.

**Q.2. Explain the Principle, Construction, Working advantages an
disadvantages of Crystal Microphone.** (10

Ans. Refer Q.2.(a) End Term Examination 2016.

**Q.3. Describe Construction and working of Monochrome Picture Tube? Hov
the picture formation takes place?** (10

Ans. Monochrome picture tube: The picture tube is a special form of cathode ra
tube, the face plate of which serves as a screen of the television receiver. The variou
parts of a monochrome picture tube are shown in Fig. The cathode ray tube (CRT) i
housed in a bell-shaped glass enclosure. A filament heats a cathode that emits electron
The negatively charged electrons are attracted and accelerated by positive-bias voltage
on the elements in an electron gun assembly. The electron gun also focuses the electron
into narrow beam.

A control grid that is made negative with respect to the cathode, controls th
intensity of the electron beam and brightness of the spot it makes. The beam i
accelerated towards the screen by a very high voltage applied to an internal metalli
coating called aquadag. The face or front of the picture tube is coated internally wit
a phosphor, that glows and produces white light, when it is struck by the electron beam

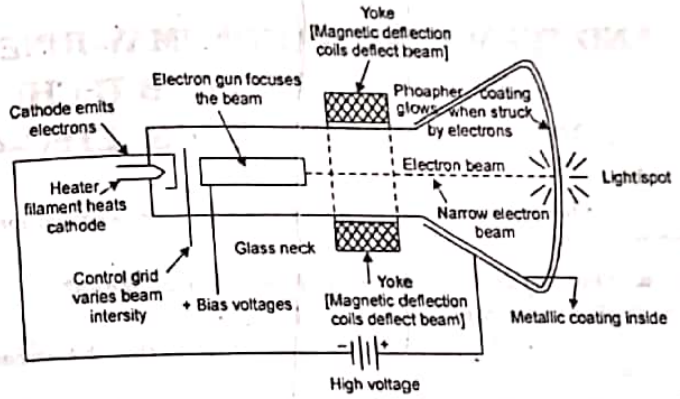


Fig. Monochrome picture tube

Around the neck of the picture tube is a structure of magnetic coils called the deflecting yoke. The horizontal and vertical current linear saw tooth waves generated by the sweep and synchronising circuits are applied to the yoke coils. This produces the magnetic field inside the tube that influence the position of the electron beam. When the electrons flow, a magnetic field is produced around the conductor through which the current flows. In a CRT, the electron beam is moved or deflected by the magnetic field produced by the deflection coils in the yoke. Thus the electron beam is swept across the face of the picture tube.

As the beam is being swept across the face of the tube to trace out the scene, the intensity of the electron beam is varied by the luminance or Y signal. The Y signal is applied to the cathode or in some cases to the control grid. The control grid is an element in the electron gun, that is negatively biased with respect to the cathode. By varying the grid voltage, the beam can be made weaker or stronger, thereby varying the intensity of the light spot produced by the beam, when it strikes the phosphor. Any shade of grey from white to black can be reproduced.

Q.4. Sketch and explain the details of horizontal blanking and sync pulses. Mention on it

(*i*) front porch, (*ii*) horizontal sync pulse, (*iii*) back porch, (*iv*) active line period. Why the front and back porch intervals provided before and after the horizontal sync pulses. (10)

Ans. Refer Q.5. End Term Examination 2017.

END TERM EXAMINATION [MAY-JUNE 2018]
EIGHTH SEMESTER [B.TECH]
CONSUMER ELECTRONICS [ETEC–408]

Time : 3 hrs. **M.M. : 75**

Note: *Attempt five questions in all including Q. no.1 which is compulsory. Select one question each unit.*

Q.1 (a) What are the requirements of a good microphone? (3)

Ans. Quality of Microphones

A microphone should have the following qualities so that it matches the above requirements.

1. Sensitivity: It is the output in milli volt for a sound pressure of 0.1 Pa (or 0.5×10^{-4} W/m^2) at 1000 Hz. Many times sensitivity is expressed in dB below 1 V.

2. Frequency Response : Audio frequency range extends from 16 Hz to 20 kHz. However an audio system is considered to be very good if it has a flat response from 40 Hz to 15 kHz.

3. Signal to Noise Ratio: All equipments generate noise i.e. extraneous signals. If the generated noise is high, the quality of sound will be poor. In a good microphone the extent of a noise should be such that the signal to noise ratio is low. This ratio is defined as the ratio at the output when sound pressure is 0.1 Pa (or 0.5×10^{-4} W/m^2) to the output in the absence of sound. Evidently the output in the absence of sound is due to noise.

4. Output Impedance: The output impedance of a microphone is expressed in ohms. The importance of this parameter arises because of the necessity to transfer maximum power to the transmission circuit. As per maximum power transfer theorem, the power transferred to the load (transmission system in this case) is maximum when load resistance is equal to source resistance.

5. Distortion: A microphone may suffer from non-linear distortion, frequency distortion and phase distortion.

Non-linear distortion means that the relative amplitudes of different frequencies in the electrical output is not same as in the sound wave. For high fidelity sound systems, non-linear distortion should be less than 1%.

Frequency distortion means that some frequencies not present in the sound signal appear in the output. This is due to natural resonant frequency of the movable parts of the microphone.

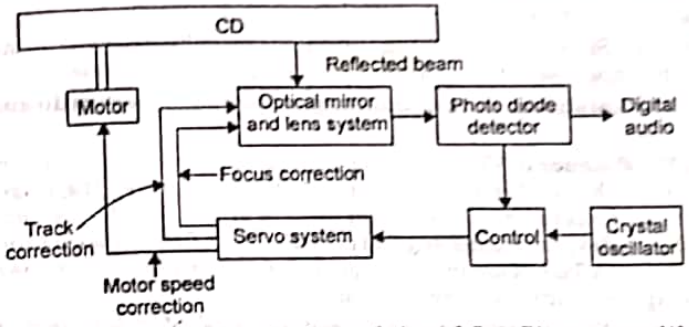
Phase distortion means that the inter-phase relationship between different frequency components in the output is not same as in the input. This generally occurs when more than one microphone are used in system.

6. Directivity: The response or sensitivity of a microphone is not the same for sounds coming from different directions. This effect is known as directivity. A microphone may be unidirectional (i.e. it can pick up sound only from one direction), bidirectional (i.e. it can pick up sounds from two directions) or omnidirectional (i.e. it can pick up sounds from all directions). However for an omnidirectional microphone the response for sounds coming from different directions in not same.

$$D = \frac{\text{Actual output in the direction of maximum output}}{\text{Output in that direction for an omnidirectional microphone}}$$

Q.1. (b) What is a compact disc? What are the advantages of an audio CD over a audio tape. (4)

Ans. Pick-up System inside the CD (Compact Disc) System is as shown below:



On CD information is stored in the form of pit and flat. Pit represent'1' and flat represent '0'. Light is not reflected from pit and is fully reflected from the flat surface.

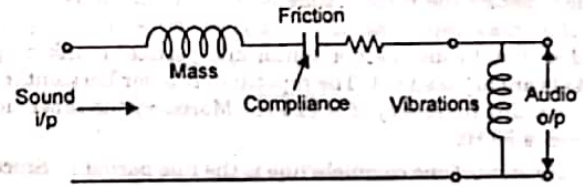
Thus when this light falls on a photosensitive diode the binary information is obtained.

This digital output of the diode is processed and is converted to the original analogue signal.

The control signals allow any combination of tracks to be played in any sequence with the help of key board. Also a display is maintained to monitor the track being played. Scanning of the track by the Laser beam is done from the centre preceding towards the edge. For this purpose the disc is rotated and laser is moved from the centre to edge. As the circumference of the outer track is layer as compared to the track inside. The track speed is maintained constant by changing rotational speed of disc from 500 r.p.m. at the centre to 200 r.p.m at the outermost edge.

Scanning speed is about 1.2 m/s. Total track length is 6 k.m. this gives playing time of 60 minutes plus 20 minutes time for error correction frequency response of CD is 20 Hz to KHz and S/N ratio is about 90 dB.

Equivalent circuit of moving Coil microphone.



This works over the principle that when a conductor is moved inside magnetic field, the e.m. f is produced.

e.g. $e = \frac{d\phi}{dt}$

$= B \times$ Change of area per second.

$= B \times$ Length of conductor $\times$ distance moved per second.

$\Rightarrow \quad e = Blv$

where $l =$ length of conductor

$v = \frac{dx}{dt}$

Characteristics: Sensitivity, 30 microvolts for a sound pressure level of 0.1 Pa. S/N : 30 dB

Frequency Response: 60 Hz to 8000 Hz for ± 1 dB.

Distortion: Less than 5%

Directivity: Since it is pressure microphone so Generally directivity is omni-directional but it can be improved to heart shaped by using ribbon microphone in series with it.

Q.1. (c) Explain the terms: Scanning frequency, aspect ratio and blanking pulses. **(4)**

Ans. Persistence of Vision: Retina has the characteristic of retaining image for a short period. This is due to the reason that retina senses the brightness by a photochemical process which has its own lag. The sensation in the eye, due to a single short flash, is a function of intensity and duration of the flash. This sensation continues for about 20 ms. A flash of low intensity and long duration causes the same sensation as a flash of high intensity and short duration.

Scanning: For converting a scene or picture into an electrical signal, the electron beam has to explore the picture point by point. This process is called scanning. Scanning is done at a fast rate thus creating an illusion of continuty due to peristence of vision.

Aspect Ratio and Gross Structure: All television systems use rectangular frames. The ratio width/height of the frame is called aspect ratio and equals 4/3. The reasons for this value of aspect ratio are:

1. The eyes can view with greater comfort and ease when width of the frame is more than the height.
2. The region of maximum resolution at the centre of the retina has greater area along the width than along the height. This region of maximum resolution at the centre of retina is called *fovea*.
3. A large width of frame means a more efficient use of the area of the fovea.
4. Aspect ratio of 4/3 is pleasing aesthetically and causes less fatigue of the eye.
5. The motion pictures have a width/height ratio of 4/3. Therefore, film programmes can be directly televised.

Blanking Pulses: It is necessary to ensure that the retrace lines during scanning are not visible. Though the retrace time is small, damped oscillatory currents in the deflection circuits may appear as light and dark stripes at the left of the screen. The composite video signal contains horizontal and vertical blanking pulses so that the retrace intervals are blanked out. The repetition rate for horizontal blanking pulses is equal to line scanning frequency of 15625 Hz. Moreover the repetition rate for vertical blanking pulses is 50 Hz.

The total duration of one complete line is the line period H. Since line frequency f_H is 15625 Hz

$$H = \frac{1}{f_H} = \frac{1}{15625} = 64\ \mu s$$

The line blanking period is 0.19H = 12 μs.

The tolerance of line blanking period is 11.8 μs to 12.3 μs.

The line blanking period is divided into three sections i.e. line sync. pulse, front porch and back porch.

The line sync. pulse is a short pulse sent from transmitter to correct the horizontal scanning rate at the TV receiver. The width of this pulse is 0.075 H = 4.7 μs with tolerance of 4.5 μs to 4.9 μs.

Q.1. (d) What is a LED TV? Discuss its advantages. **(5)**

Ans. LED TV uses light emitting diodes (instead of cold cathode fluorescent lamp used in LCD TV). Thus it is a flat panel display using LED. Use of LED means thinner panel and lower power consumption (than LCD). Moreover heat dissipation is better, display is very bright and contrast control is also better.

LED TV can be full array LED or Dynamic local dimming LED. The dynamic local dimming control allows dimming of some areas darkness for better constrast.

Comparison of LED and LCD TV

1. LED TV has better dynamic control
2. LED TV is extremely thin.
3. LED TV causes less environmental pollution at the time of disposal
4. LED TV uses 20-30% less power than LCD TV
5. LED TV is more reliable than LCD TV
6. LED TV is more expensive than LCD TV

LED TV applies pulse width modulation to supply current for dimming control. Thus lights can switched on and off faster than what eye can perceive.

Q.1. (e) Explain the concept of luminance, Hue and saturation. **(5)**

Ans. Luminance: It is the brightness which is produced as a result of video signal obtained at the picture tube.

Hue: It is the colour of the scene to be televised. Thus the coilour of any object is distinguished by its hue or tint.

Green leanes are looking green because of its green hue.

Different hue result from the different spektral radiation and are perceived as such by the set of cones of retina.

Saturation: It is the spectral purity of colour light. Since single hue occur rarely alone, this shows the amount of other colour present.

If red hue is saturated, it mean it is purely red colour and no any other colour is present, in it. The hue a saturation of a colour put together is known as chrominance.

Q.1. (f) What is Composite Video signal? Explain. **(4)**

Ans. The composite video signal has three components i.e.,

1. Video signal contains the picture information
2. Synchronising pulses to synchronise the horizontal and vertical scanning at the transmitter and receiver.
3. Blanking pulse to make the retrace invisible.

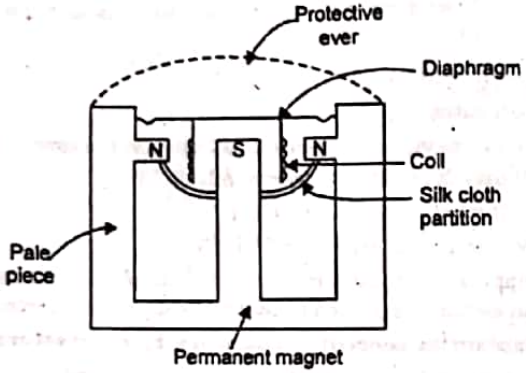
The video signal and synchronising pulses are not needed together. The synchronising pulses are required at the end of horizontal and vertical scans. During the scanning the level of video signal changes between the extremes of white and black and the intermediate levels of grey. The synchronising pulses have a different amplitude level (blacker than that of black) so that they can be easy separated at the television receiver. The ratio of picture details so synchronising pulse amplitude is 7 : 3.

UNIT-I

Q.2 (a) Discuss the working of following microphones

(i) Moving coil

Ans. Moving coil Microphone: It is also called as dynamic microphone. A copper coil is attach to the diaphragm. When mechanical air pressure variation falls over the diaphragm, it moves or vibrates around its mean position, because of this the coil attached to it also vibrates. This coil is placed inside the magnetic field so when this coil moves inside the constant flux, an emf is generated across its terminals. This emf causes a current to flow inside the coil which is called as the audio current.



(ii) Condenser (6.5)

Ans. Condenser means capacitor, an electronic component which stores energy in the form of an electrostatic field. The term condenser is actually obsolete but has stuck as the name for this type of microphone, which uses a capacitor to convert acoustical energy into electrical energy.

Condenser microphones require power from a battery or external source. The resulting audio signal is stronger signal than that from a dynamic. Condensers also tend to be more sensitive and responsive than dynamics, making them well-suited to capturing subtle nuances in a sound. They are not ideal for high-volume work, as their sensitivity makes them prone to distort.

How Condenser Microphones Work: A capacitor has two plates with a voltage between them. In the condenser mic, one of these plates is made of very light material and acts as the diaphragm. The diaphragm vibrates when struck by sound waves, changing the distance between the two plates and therefore changing the capacitance. Specifically, when the plates are closer together, capacitance increases and a charge current occurs. When the plates are further apart, capacitance decreases and a discharge current occurs.

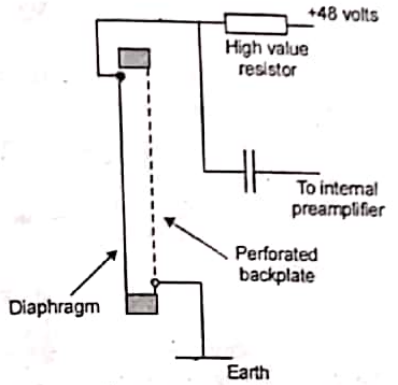
Electrical characteristics: The diaphragm of the microphone forms one of the plates of a capacitor. The other plate is the backplate, which is close to and parallel to the diaphragm.

In any capacitor, $Q = C \times V$ - more appropriately represented here as $V = Q/C$

Q represents electrical charge. When a capacitor is charged, there is an imbalance between the quantity of electrons on one plate compared to the other.

C represents capacitance, which is the ability of the capacitor to store charge. V is voltage.

Because $V = Q/C$, a capacitor with a low value of capacitance will measure a greater voltage across the plates than a capacitor with a high capacitance, for the same value of charge. The diaphragm and backplate of the microphone are charged up to a voltage of 48 V (typically). This is done through a high-value resistor so the audio signal is not affected.



The capacitance of any capacitor is governed in part by the separation between the plates. The closer the plates, the higher the capacitance.

Because $V = Q/C$, if the capacitance changes, then the voltage changes inversely in proportion.

Since one of the plates of the capacitor in the capacitor microphone is the diaphragm, which moves in response to sound, then as the separation between the plates changes in response to that sound, the capacitance changes and so does the voltage across the plates.

The AC component of this changing voltage is the signal produced by the microphone in response to sound.

Further points: The capacitor microphone can only produce a very weak current from the diaphragm (i.e. it is high impedance). Therefore a capacitor microphone must have an internal amplifier close to the diaphragm.

Capacitor microphones require electricity to charge the diaphragm and backplate, and to power the internal amplifier.

An electric capacitor microphone employs a backplate that is permanently charged, hence there is no requirement for a source of electricity to charge the diaphragm. However, there is still an internal amplifier that requires power. This can be an internal battery.

Ans. (iii) Carbon Microphone:

(a) Principle : When carbon granules are packed in a casing, the resistance of granules depends on the applied presure. The sound waves impinge on the diaphragm which compresses the granules. The change in resistance causes a change in voltage in a circuit. This voltage is proportional to pressure of sound waves.

(b) Construction: Fig. shows the construction. Fine carbon granules are packed in a case as shown. The sound pressure acts on a metallic diaphragm. The movable metal piston transmits this pressure to a movable carbon (or metallic) plate. The second metallic plate is fixed. A battery is connected between the two plates. A transformer is used to eliminate the dc content in the microphone output.

(c) Working: When sound waves impinge on the diaphragm, it vibrates. As a result the carbon granules get compressed or loosened. When the granules are compressed, their resistance decreases. When loosened, their resistance increases. This change in resistance of granules changes the current in the circuit. This changes in current causes a change in terminal voltage.

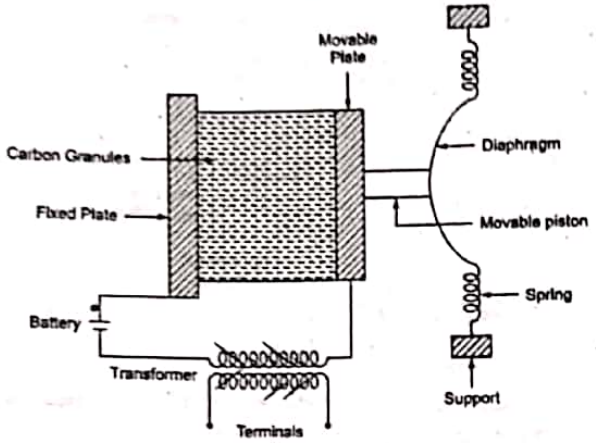


Fig. Carbon Microphone

(*d*) Features :

1. V.Good sensitivity, about 20 dB below 1 V. The output voltage is about 100 mV.
2. The frequency response is limited between about 200 Hz to 5000 Hz.
3. The signal to noise ratio is poor. Random variation of carbon resistance causes a rather continuous noise.
4. Its output impedance is about 100 ohms.
5. Its distortion is also high, about 10%.
6. It is more or less omni directional.

(*e*) Advantages: Very rugged, Smal size, Very cheap, Good sensitivity.

(*f*) Disadvantages: Poor signal to noise ratio, high distortion, limited frequency respones Not suitable for high fidelity-work.

(*g*) Applications: Telephones, portable radios.

Q. 2. (*b*) Discus the principle of operation, construction, freature and application of horn type speaker. **(6)**

Ans. A horn type loudspeaker uses an acoustic horn to increase the overall efficiency of the driving elements. It consists of a compression driver which produces sound waves with a small metal diaphragm vibrated by an electromagnet, attached to a horn, a flaring duct to conduct the sound waves to the open air.

Working: Acoustic horns convert large pressure variations with a small displacement area into a low pressure variation with a large displacement area and vice versa. The small cross-sectional area of the throughput restricts the passage of air thus presenting a high acoustic impedance to the driver. This allows the driver to develop a high pressure for given displacement. Therefore the sound waves at the throat are of high pressure and low displacement. The tapered shape of the horn allows the sound waves to gradually decompress and increase in displacement but large displacement.

Advantages: Horn loudspeakers can provide very high efficiencies, making them a good match for very low-powered amplifiers, it can also be used to provide very high sound pressure levels needed for sound reinforcement.

Disadvantages: A major problem of horn speakers is that the radiation pattern varies with frequency. High frequency sound tends to be emitted in narrow beams with poor off-axis performance.

Application.

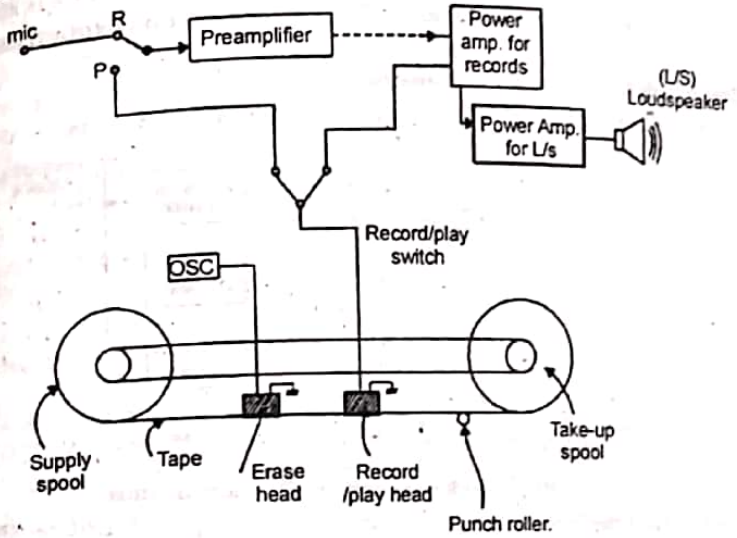
(i) For public address and concert use (ii) Commercial theaters

(iii) Home music and theater.

Q.3. (*a*) Draw a neat diagram of tape transport mechanism of a tape recorder and explain its working. **(6.5)**

Ans. The tape should move at a steady speed for the recording and playback process. The basic type transport mechanism is shown as follow: It consist of the following components:

Motor: It is a synchronous type motor. This is having a characteric of keeping a constant spread irrespective of variation of supply voltage and load. This reduces wow and flutter noise.



2. Pinch roller (Capston): Capston is a spindle machined accurately and pulls the tape past the head. The tape is pressed against the capstan by means of a rubber covered pinch roller.

3. Flywheel: It is a heavy wheel made of a metal and is fitted to the capston shaft. This damps minor variation in the speed.

4. Tape Guides: These provide the desired tension in the tape and keep it in the right direction. All the bearings over which the tape passes must of high quality.

5. There are two spools:

(i) Supply spool which provide the tape to the other direction.

(ii) Take-op;spool: The spool which take the reel from the other side.

Q. 3. (*b*) Explain the features of a Hi-Fi system. **(6)**

Ans. Refer Q.1. (c) of End Term Examination 2017.

UNIT-II

Q.4 (*a*) Draw the diagram of vidicon camera tube. Explain the functions of various parts. **(6)**

Ans. Refer Q. 4. (a) of First Term Examination 2017.

Q. 4. (*b*) What is CCIR-B system? Give its features. **(6.5)**

Ans. CCIR-B SYSTEM: CCIR stands for Committee Consultative for International Radio. It has not adopted any uniform TV standard. As such we have CCIR-B standard (used in India, Germany etc.), CCIR-L standard (used in France etc.) and CCIR-M

standard (used in USA). Evidently television receivers designed for one-standard cannot be used for any other standard.

CCIR-B system has 625 scanning lines per frame with 2 : 1 interlace (i.e. two fields scanned sequentially but interleaved to form the complete picture). The field frequency is 50 Hz and the picture fequency is 25 Hz. The horizontal line frequency is 625 × 25 = 15625 Hz and the maximum possible deviation is 0.1%.

The ratio of width to height of the picture is called 'Aspect ratio' and is 4/3. Total scanning time of 1 line including retrace period is 64 μs (52 μs for line scanning and 12 μs for blanking or retrace). The number of lines lost in vertical retrace is 20 per field.

Q.5 (a) Draw the block diagram of TV transmitter and explain its working. (8)

Ans. Block Diagram of TV Transmitter

Fig. shows a simple block diagram of a TV transmission system

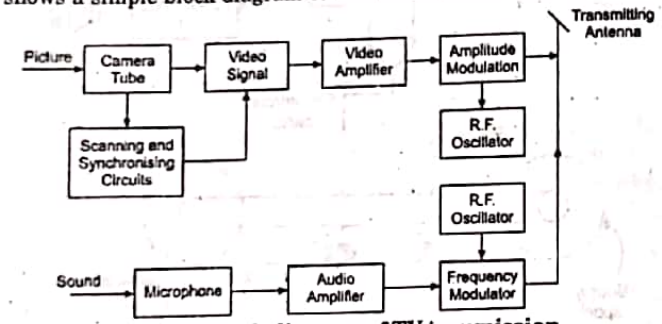


Fig. Block diagram of TV tranmission

The camera tube focuses the picture or scene on to a photosensitive-plate to form an image on it. The picture elements are converted into electrical signals by a process known as scanning. The electrical signal so obtained is known as video signal. The function of synchronising circuit is to supply synchronising pulses which identify the retrace so that the scanning rate at the receiver can be controlled. The purpose is that scanning at transmitter and receiver must be in synchronims.

The video signal has wide frequency range 25 Hz and 5 MHz. It is amplified by a wide band RC coupled amplifier to increase its strength. An RF oscillator provides a high frequency radio wave for modulating the video signal. The large bandwidth of video signal requires very high frequencies (VHF) and ultra high frequencies (UHF) for modulation Moreover these VHF and UHF carrier waves must have frequencies greater than the highest video frequency of 5 MHz. The bandwidth of each TV channel is also greater than 5 MHz. Propagations at the VHF and UHF is by space waves whose range is restricted to line of sight distance. Therefore, the range of reception of TV signals is restricted to line of sight distances. .

Modulation of video signals is possible only by amplitude modulation because of large bandwidth requirement. Frequency modulation of video signal of large bandwidth is accompained by acute interference and is not used. The sound waves are converted into audio signal by microphone. The audio signal is amplified by an audio amplifier Another RF oscillator provides the carrier wave for audio signal. Frequency modulation provides noise free reception with much less power requirement than amplitude modulation. Therefore, frequency modulation is used for modulating the audio signal Both video and audio signals are radiated into space by the transmitting antenna.

The above given block diagram illustrates the principle of TV transmitter.

Q.5. (b) What is night vision camera? Explain. (4.5)

Ans. Night Vision Camera

Night vision is the ability to see in low-light conditions. Whether by biological or technological means, night vision is made possible by a combination of two approaches: sufficient spectral range, and sufficient intensity range. Humans have poor night vision compared to many animals, in part because the human eye lacks a tapetum lucidum.

Night-useful spectral range (i.e. 400-700 nm) techniques can sense radiation that is invisible to a human observer. Human vision is confined to a small portion of the electromagnetic spectrum called visible light. Enhanced spectral range allows the viewer to take advantage of non-visible sources of electromagnetic radiation (such as near-infrared or ultra violet radiation). Some animals such as the mantis shrimp can see using much more of the infrared and/or ultraviolet spectrum than humans.

Intensity Range: Sufficient intensity range is simply the ability to see with very small quantities of light. Many animals have better night vision than humans do, the result of one or more differences in the morphology and anatomy of their eyes. These include having a larger eyeball, a larger lens, a larger optical aperture (the pupils may expand to the physical limit of the eyelids), more rods than cones (or rods exclusively) in the retina, and a tapetum lucidum. Enhanced intensity range is achieved via technological means through the use of an images intensifier, gain multiplication CCD, or other very low-noise and high-sensitivity array of photodetectors.

UNIT-III

Q.6. Draw the block diagram of color TV reciver and explain its working. (12.5)

Ans. Refer to Q.4.(a) End Term Examination 2016.

Q.7 (a) Explain the trintron television tube with diagram. (6.5)

Ans. Refer to Q.6.(a) End Term Examination 2016.

Q.7. (b) Write short note on PAL system. (6)

Ans. Refer to Q.6.(b) End Term Examination 2016.

UNIT-IV

Q.8 (a) What is cable transmission? Why is it needed? (6.5)

Ans. Cable System: Edge Head (Head End)

Edge provides event signals (programs) for all channels. Local broadcasting and a much captured by an antenna mounted on top of a very high tower in order to extend the distance limit of view. These signals can be distributed it as their home channels number.

Distribution Cables: Frequency losses in coaxial cables is high, especially those working in the super frequency region from cable TV. However, loss-loss of channel offset by using a radio frequency amplifier with a wide field of frequencies that are placed along the cable network.

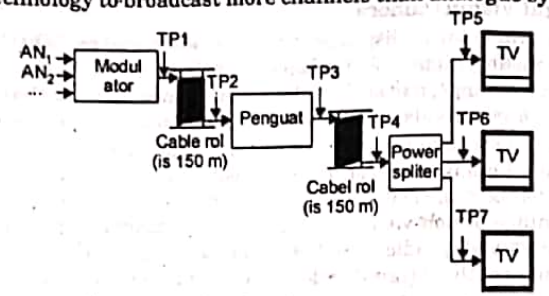
In distribution systems, main channel is the trunk From this main line, branch cables extended to groups of customers'. Channel for each customer referred to the drop.

Each amplifier channel has a strengthening of the same trunk with a loss channel for the distance between the amplifier Typical value is 40 dB, or a strengthening of the voltage at 100.

Definition: Cable television is a television broadcasting system via radio frequency signals transmitted via fiber optic or coaxial cables are fixed and not through the air like a regular television broadcasts that must be captured antenna (over-the-air). In addition to telvision, FM radio show, internet, and phones also can be delivered via cable. This system is often found in North America, Europe, Australia, East Asia, South America, and Middle East.

Cable television was less successful in Africa because of low population densities in various regions. Like radios, different frequencies are used to distribute many channels

through one cable. A receiver box used to select a television channel. Modern cable systems now use digital technology to broadcast more channels than analogue system.



How it works In a cable system, the signal may have exceeded 30 or 40 amplifiers before reaching your home, one for each 1000 feet or more, with each amplifier you can get noise and distortion. Pulse if one of the amplifiers fails you will lose the image. Posta cable systems do not have good image quality and can not be trusted. At the end of 1970, cable TV amplifiers find a solution to the problem. Since then they also make the technology they can add programming to cable service.

Adding channels In the early 1950s, cable systems began to experiment with how to use micro glom bang sender and receiver tower to catch signals from distant stations. In some cases, this way to make television available to the people who live outside the area of broadcast standards.

That means cable TV subscribers may be able to access to several broadcasting stations that have the same network. For the first time the TV cable is used to increase the spectator not only the usual spectator. This started a trend that started the boom in its cable TV in the 1970s. The addition of the station CATV (Community Antenna Television) and cable distribution system directs the author to add a switch most of the television setting.

People can manage their television channels to choose on the basis of the frequency allocation plan of the Federal Communications Commission or they can set all to plan for the use by most cable systems. Two different plans its interests. In both search systems, each television station has provided six mega hertz part of the radio spectrum. The FCC has become part of the spectrum of very high frequency (VHF) to 12 television channels

Q.8. (*b*) Write short note on fuzzy logic washing machine. (6)

Ans. The present day microcontroller controlled automatic washing machine has a long history.

In very olden days washing of clothes was by hand beating and scrubbing. Then came the steam operated machine. Then appeared the gasoline operated washing machine. Development of electricity was the advent of automatic electric washing machine around 1937. Mechanical timers were used at that time. In 1970 electric twin tub washing machine was invented. In 1990 the microcontroller controlled automatic washing with electronic timer came in the market.

Present day washing machines have two main version i.e. top loading and front loading.

In top loading or vertical axis washing machine the clothes are placed in a vertically mounted perforated basket. This basket is contained in a water retaining tub with finned water pumping agitator in the centre of the bottom of basket. The clothes are loaded through top of the machine. During washing the outer tub is filled with water sufficient to immerse and suspend the clothes. The agitator pushes water outwards, then downwards in a circulatory motion. The direction of rotation of agitator is reversed periodically.

The second design is front loading or horizontally mounted axis machine. The inner basket and outer bits are mounted horizontally. Loading of clothes is through a door in

the front of the machine. A transparent window is also provided. The agitation is in the form of back and forth rotation of cylinder. The front loading design is simple than top loading design.

All automatic washing machine use single phase capacitor start induction motor. Some models use two motors i.e. wash motor and spin motor.

The controls available in fully automatic machine are: Water temperature, Drum speed, water level, Door closed indication.

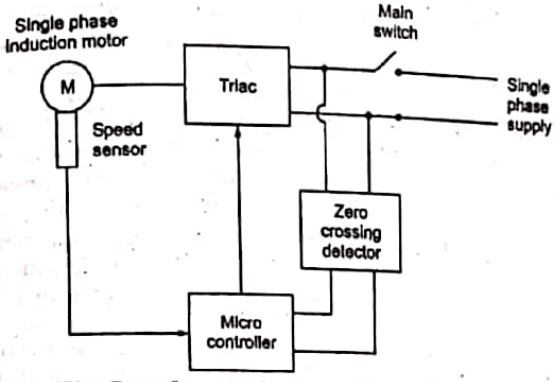


Fig. Speed control scheme for washing motor

The speed control is achieved by firing angle control of triac.

The supply is given to microcontroller through a zero crossing detector (to detect the start of ac cycle because fining angle of triac is counted from the instant of zero of ac wave. Depending on speed setting, the microcontroller sets the firing angle of triac. The voltage applied to the motor depends on the firing angle of triac. A delayed firing of triac means lesser input voltage to motor and lesser speed. The speed sensor senses the actual speed and sends the speed signal to micro controller which adjusts the speed to the desired value.

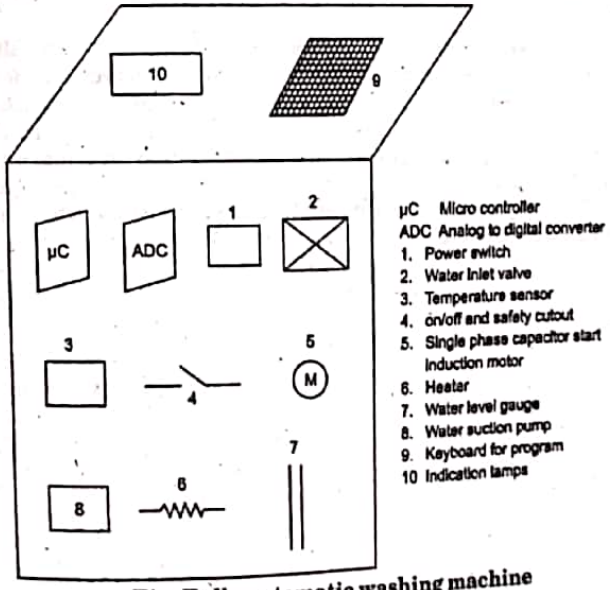


Fig. Fully automatic washing machine

Q.9 Explain the following :-

(a) HDTV (6)

Ans. Refer to Q.8.(a) End Term Examination 2016.

Q.9. (b) RFID and bluetooth technology (6.5)

Ans. Radio-frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects. The tags contain electronically-stored information. Passive tags collect energy from a nearby RFID reader's interrogating radio waves. Active tags have a local power source (such as a battery) and may operate hundreds of meters from the RFID reader. Unlike a barcode, the tag need not be within the line of sight of the reader, so it may be embedded in the tracked object. RFID is one method for Automatic identification and Data Capture (AIDC).

RFID tags are used in many industries, for example, an RFID tag attached to an automobile during production can be used to track its progress through the assembly line; RFID-tagged pharmaceuticals can be tracked through warehouses; and implanting RFID microchips in livestock and pets allows for positive identification of animals.

Since RFID tags can be attached to cash, clothing, and possessions, or implanted in animals and people, the possibility of reading personally-linked information without consent has raised serious privacy concerns.These concerns resulted in standard specifications development addressing privacy and security issues. Use of on-chip cryptography methods for un-traceability, tag and reader authentication, and over-the air- privacy. Chip specifies a digital signature data structure for RFID and barcodes providing data; Source and read method authenticity. This work is done with in automatic identifications and data capture techniques. Tags can also be used in shops to expedite checkout, and to prevent theft by customers and employees

Bluetooth: Bluetooth is a wireless technology standard for exchanging data over short distances (using short wavelength UHF radio waves in the ISM band from 2.400 to 2.485 GHz) from fixed and mobile devices, and building personal area networks (PANs). Invented by Dutch electrical engineer Jaap Haartsen, working for telecom vendor Ericsson in 1994, it was originally conceived as a wireless alternative to RS-232 data cables.

Bluetooth is managed by the Bluetooth Special Interest Group (SIG), which has more than 30,000 member companies in the areas of telecommunication, computing, networking, and consumer electronics. The IEEE standardized Bluetooth as IEEE 802.15.1, but no longer maintains the standard. The Bluetooth SIG oversees development of the specification, manages the qualification program, and protects the trademarks. A manufacturer must meet Bluetooth SIG standards to market it as a Bluetooth device. A network of patents apply to the technology, which are licensed to individual qualifying devices.

FIRST TERM EXAMINATION [FEB. 2019]
EIGHTH SEMESTER [B.TECH]
CONSUMER ELECTRONICS [ETEC–408]

Time : 1½ hrs. M.M. : 30

Note : Q. No. 1 is compulsory. Attempt any two more questions from the rest.

Q.1. (a) Explain directivity and sensitivity of a microphone. (3)

Ans. The directivity of all microphones is frequency dependent, and become spherical as the frequency decreases. Directional microphones are also called 'pressure gradient' mics, because their directional characteristics are created by means of varying pressure to the front and rear of the diaphragm (the pressure gradient).

Microphone sensitivity is the measure of the microphone's ability for converting acoustic pressure into an electric voltage. The higher the sensitivity, the less amplification required to bring the sound to a useable level on the mixer channel.

Q.1. (b) Differentiate between Woofers and Tweeters? (3)

Ans. The main difference between woofers and tweeters is that the woofers are a lot larger than the tweeters. A good woofer might be 12 inches in diameter or more. There are a couple of reasons for that. First of all, the speaker has to move slower and the diaphragm (the speaker cone) has to move farther to create the sound wave. Secondly, the speaker must produce a higher volume of sound, as low frequency sound waves don't travel as well as high frequency ones do and are much more likely to dissipate and be absorbed by surfaces they come into contact with.

Tweeters do not interact with their cabinets at all, and at times are used without a cabinet. While the construction is similar to a standard electromagnetic speaker, they usually use a dome-shaped diaphragm in place of a speaker cone. These are referred to as "dome tweeters." This diaphragm can either be made of plastic, plastic impregnated silk, aluminum or titanium. Each material type produces its own unique sound characteristics.

Since tweeters are small, they don't produce a lot of volume. To help this, many are attached to a horn. This horn resonates or vibrates with the tweeter, mechanically amplifying the sound that it produces, in much the same way that a trumpet or other brass instrument amplifies the buzzing of the musician's lips.

Q.1. (c) Explain different pressure gradients in microphone. (4)

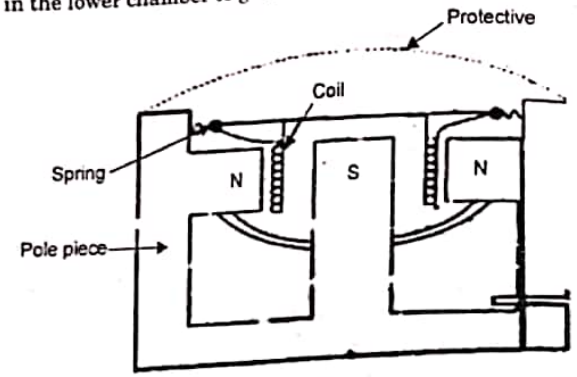
Ans. A microphone in which both sides of the diaphragm are exposed to the incident sound. The microphone is therefore responsive to the pressure differential (gradient) between the two sides of the membrain. Sound waves parallel to the plane of the diaphragm produces no pressure differential, and so pressure-gradient microphones have figure-eight directional characteristics. These are also sometimes called "velocity microphones", since the output voltage is proportional to the air particle velocity.

Q.2. (a) Explain the principle, Construction, Working, advantages and disadvantages of Moving coil Microphone. (8)

Ans. Moving Coil Microphone (or) Dynamic Microphone.

Principle: Moving coil microphone uses the principle of electro magnetic induction. When sound pressure variations moves a coil placed in magnetic field there is a change of magnetic flux passing through the coil an emf is therefore induced in the coil and thus emf forms output of the microphone.

Construction: The construction detail of the microphone is shown in fig.. The main components of a moving coil microphone are magnet, diaphragm and coil. The magnet is a permanent magnet with a south pole as central pole piece and North pole as peripheral pole piece. This type of magnet gives uniform magnetic field in the gap between the pole pieces. Diaphragm is of non-magnetic material and is light weight. It is fixed to the body of the magnet with the help of springs coil is wound on card board cylinder which is attached to the diaphragm. The coil is single layered enameled wire. A protective cover is used to save the delicate diaphragm and coil assembly from being mishandled. A silk cloth partition is used to separate the upper chamber from the lower chamber. A small tube is used in the lower chamber to give access to the free atmosphere.



Working: When sound waves strike the diaphragm it moves and hence coil moves in and out in the magnetic field. This motion changes the flux through the coil which results in emf being produced in the coil due to electromagnetic induction. The value of emf depends on the rate of change of flux and hence on the motion of the coil. The displacement of the coil depends on the pressure of sound waves on the diaphragm. Thus this microphone induces more voltage. The induced voltage is the faithful replica of the sound pressure variation.

Specifications

1. Sensitivity: 30 Micro Volts
2. S/N Ratio: 30 db
3. Frequency Response: 60Hz — 8KHz.
4. Distortion less than 5%
5. Output Impedance = 25 ohms.

Applications

These are widely used in PA System and in broad cast studios.

Advantages

1.Moving coil instruments consume quite less power. This is because the resistance of moving coil is small.

2.In Moving coil meters the ratio of torque to weight is quite high and this reduces the errors due to friction.

3.The scale of moving coil instrument is uniform.

4.A low range ammeter can be used as both ammeter and voltmeter to measure high currents and voltages.

5.PMMC meters are free from errors which would be caused by hysteresis and stray magnetic fields.

6.Damping is very simple and effective in moving coil meters.

Disadvantages

1.Due to friction at the bearings and temperature variations, errors are likely to be present and the observed readings are may not be accurate and fresh calibration of the meters may become necessary.

2.With long usage permanent magnet gets weakened and this likely may introduce errors in readings.

Q.2. (b) Define SNR in terms of microphone. (3)

Ans. The signal-to-noise ratio (SNR) specifies the ratio of a reference signal to the noise level of the microphone output. This measurement includes noise contributed by both the microphone element and the ASIC incorporated into the MEMS microphone package. The SNR is the difference in decibels between the noise level and a standard 1 kHz, 94 dB SPL reference signal. SNR is calculated by measuring the noise output of the microphone in a quiet, anechoic environment. This specification is typically presented over a 20 kHz bandwidth as an Aweighted value (dB_A), which means that it includes a correction factor that corresponds to the human ear's sensitivity to sound at different frequencies. When comparing SNR measurements of different microphones, it is important to make sure that the specifications are presented using the same weighting and bandwidth; a reduced bandwidth measurement makes the SNR specification better than it is with a full 20 kHz bandwidth measurement.

Q.3. Describe Construction and working of Monochrome Picture Tube? How the picture formation takes place? (10)

Ans. Refer Q.3. of First Term Examination 2018. (Page No. 2-2018)

Q.4. (a) Explain the details of horizontal blanking and sync pulses. Mention on it (i) Front porch, (ii) Horizontal sync pulse, (iii) Back porch. (7)

Ans. Refer Q.5. of First Term Examination 2017. (Page No.17- 2017)

Q.4. (b) Explain the features of Hi-Fi System. (3)

Ans. Refer Q.1.(d)(iii) of First Term Examination 2017. (Page No.4- 2017)

END TERM EXAMINATION [APRIL-MAY 2019]
EIGHTH SEMESTER [B.TECH]
CONSUMER ELECTRONICS [ETEC–408]

Time : 3 hrs. **M.M. : 7**

Note :- *Attempt five questions in all including question no. 1 which is compulsory. Select one question from each unit.*

Q.1. Attempt the following:-

Q.1. (a) Differentiate woofer and tweeter.

Ans. Refer question no. 1.(b) of First Term Examination 2019. (3)

Q.1. (b) What do you mean by persistence of vision? (3)

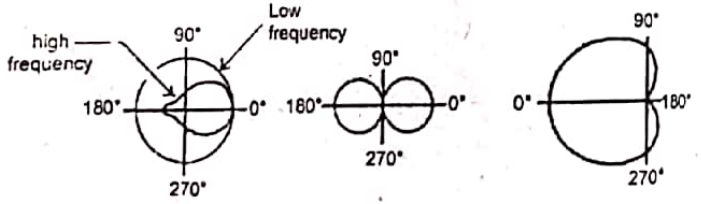
Ans. According to the theory of persistence of vision, the perceptual processes of the brain or the retina of the human eye retains an image for a brief moment of time. This theory is said to account for the illusion of motion which results when a series of film images are displayed in quick succession, rather than the perception of the individual frames in the series.

Persistence of vision should be compared with the related phenomena of beta movement and phi movement. A critical part of understanding these visual perception phenomena is that the eye is not a video camera: there is no "frame rate" or "scan rate" in the eye: instead, the eye/brain system has a combination of motion detectors, detail detectors and pattern detectors, the outputs of all of which are combined to create the visual experience. The frequency at which flicker becomes invisible is called the flicker fusion threshold, and is dependent on the level of illumination.

Q.1. (c) Explain directivity of microphone. (3)

Ans. The pattern of sensitivity of MICROPHONE according to direerection, usuallydemonstrated as polar diagram where the length of the radius in any direction given the response in decibels of the microphone.

Usaually this repsonse is measured for various frequencies, the result of which may be combined in a single diagram, since in many cases a uniformity of response over a large frequency range is desirable. The directional characteristics of the acoustic radiation of any sound source including loudspeakers may also be indicated by such diagrams.



Q.1. (d) Comparison of LED & LCD TV.

Ans.

Basis For Comparison	LED	LCD
Definition	PN-Junction device which discharge visible lights when an electrical charge passes through it.	It is an optical device used for displaying the information in the form of text and images
Stand For	Light Emitting Diode	Liquid Crystal Display
Backlight	No backlight	Cold cathode fluorescent lamp provides backlight.
Resolution	High	Low
Power Requirement	More	Less
Display Area	Small	Large
Cost	High	Low
Material	Gallium arsenide phosphide.	Liquid crystals and glass electrodes.
Switching Time	Fast	Slow
Direct Current	Do not effects.	Reduces Life Span
Contrast Ratio	Low	High
Mercury	Not used	Used

Q.1. (e) Why picture signal is Amplitude modulated and sound system is frequency modulated in TV transmission? (4)

Ans. Refer Q.no. 1.(c) of First Term Examination 2018. (Page No. 2-2018)

Q.1. (f) Explain noise reduction system in magnetic tapes. (3)

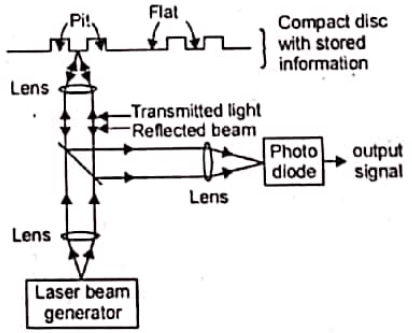
Ans. A Dolby noise-reduction system, or Dolby NR, is one of a series of noise reduction systems developed by Dolby Laboratories for use in analog magnetic tape recording. The first was Dolby A, a professional broadband noise reduction for recording studios in 1965, but the best-known is Dolby B (introduced 1968), a sliding band system for the consumer market, which helped make high fidelity practical on cassette tapes which used a relatively noisy tape size and speed. It is common on high fidelity stereo tape players and recorders to the present day. Of the noise reduction systems, Dolby A and Dolby SR were developed for professional use. Dolby B, C, and S were designed for the consumer market. Aside from Dolby HX, all the Dolby variants work by companding, or compressing the dynamic range of the sound during recording and expanding it during playback.

UNIT-I

Q.2. (a) How is audio information stored & retrieved in CD player? Explain with the help of simple neat block diagram. (6.5)

Ans. Inside the CD player the information stored on the Compact Disc is in the form of pit and flat.

Following mechanism is used for retrieving the stored information.



There is neglible reflection from the pit and almost full reflection from the flat portion.

Pits Corresponds to 0's stored Flats corresponds to 1's stored.

In this manner the information stored in the form of 0's and 1's is retrieved.

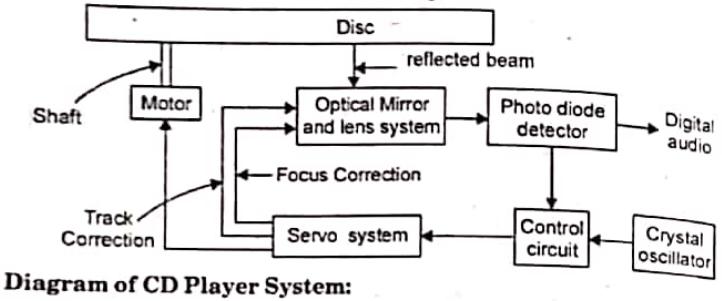
It is obtained by means of photo diodes array which converts the laser light into into electrical bits. The digital output of diode is converted and processed in the form of codes

The control signals allow any combination of tracks to be played in any sequence by simply pressing the switches from the key board.

Also a display of text is provided to monitor the track being played.

The clock signal is obtained from the disc itself it is compared with the crystal oscillaters signal and any discrepancy occuring is feed to the servo system to correct the error occuring.

The whole process is shown in the block diagram.



Block Diagram of CD Player System:

Scanning of tracks is done by moving the laser beam section from centre to the outer peripheral, since circumferance of outer spiral is more than the inner spiral.

But we have to maintain the track speed and constant that is called as constant Linear velocity. This is done by changing the speed of disc from 500 r.p.m. of the centre to 200 r.p.m. at the outer peripheral.

The scanning speed is about 1.2 m/s and this gives a playing time of 160 minutes and 20 minutes for error correction.

Q.2. (b) Why scanning & synchronizing pulses rfequired for TV communication system. (6)

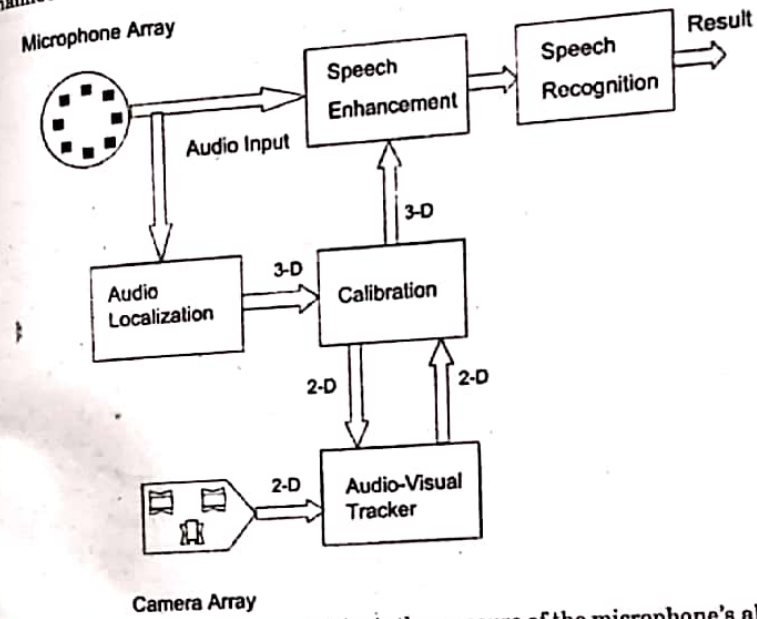
Ans. Scanning is the important process carried out in a television system in order to obtain continuous frames and provides motion of picture. The scene is scanned both in the horizontal and vertical directions simultaneously in a rabid rate. As a result sufficient number of complete picture of frames per second is obtained to give the illusion of continuous motion.

In general, synchronizations is the process in which the signals are transmitted and received in accordance with the clock pulses. In synchronization of Television transmitter, a sharp pulse is sent between each video signal line so that to maintain the impeccable transmitter-receiver synchronization. The receiver detects the video signal, synchronizing the transmitter and receiver is necessary to overcome the delay between different video packet arrivals. The receiver must start scanning same line on the CRT output display or picture tube when the TV camera starts scanning that line, these are the horizontal lines that are being scanned. The scanning speed of transmitter and receiver must be same so as to avoid signal distortion and deformation at the image in receiver output. When horizontal lines are completely scanned, vertical fly back or retrace must occur simultaneously at both transmitter and receiver moving the electron beam from bottom line end to the start of the top line. When the electron beam is returned to the left-hand side to start tracing a new line during the horizontal retrace, must occur inadvertently at both transmitter and receiver.

Q.3. Explain Microphone with the help of neat block diagram. Explain the following terms in respect of microphone i.e. Sensitivity, Directivity, SNR, Frequency Response, Output Impedance and Distortion. (12.5)

Ans. The microphone is a transducer device which converts sound energy into electrical energy. Microphones are often referred to a MIC. A microphone is used to capture some sort of sound and produce an electrical signal according to it.

A microphone has a sensitive component which converts the air pressure variations created by the sound wave into electrical signal. Depending on this component and the method to convert the sound wave into Electrical signal, there are various type microphones are availab'e in the electronics and sound engineering field. Most common types are Dynamic Microphones, Condenser Microphone, Piezo electrical microphone etc.



Sensitivity: Microphone sensitivity is the measure of the microphone's ability for converting acoustic pressure into an electric voltage. The higher the sensitivity, the less amplification required to bring the sound to a useable level on the mixer channel. The less the sensitivity, the greater the amplification required.

Directivity: The pattern of sensitivity of a MICROPHONE according to direction, usually demonstrated as a polar diagram where the length of the radius in any direction gives the RESPONSE in DECIBELs of the microphone.

Signal to Noise Ratio (SNR): The SNR is the difference in decibels between the noise level and a standard 1 kHz, 94 dB SPL reference signal. SNR is calculated by measuring the noise output of the microphone in a quiet, anechoic environment.

Frequency Response: Frequency response refers to the way a microphone responds to different frequencies. It is a characteristic of all microphones that some frequencies are exaggerated and others are attenuated (reduced). For example, a frequency response which favours high frequencies means that the resulting audio output will sound more trebly than the original sound.

Output Impedance: One important characteristic of a microphone is its output impedance. This is a measurement of the AC resistance looking back into the microphone. Generally, microphones can be divided into low (50–1,000 ohms), medium (5,000–15,000 ohms) and high (20,000+ ohms) impedance.

Distortion: It occurs due to limitations and other nonlinearities in a system. Even the sound in the air has a limitation to its magnitude. When the sound pressure level exceeds 194 dB SPL, there are no more air molecules to form the negative part of the soundwave as it reaches the point of a total vacuum.

UNIT-II

Q.4. (a) With the help of block diagram explain the working of a monochrome TV. (6.5)

Ans.

The block diagram of monochrome TV transmitter is shown below

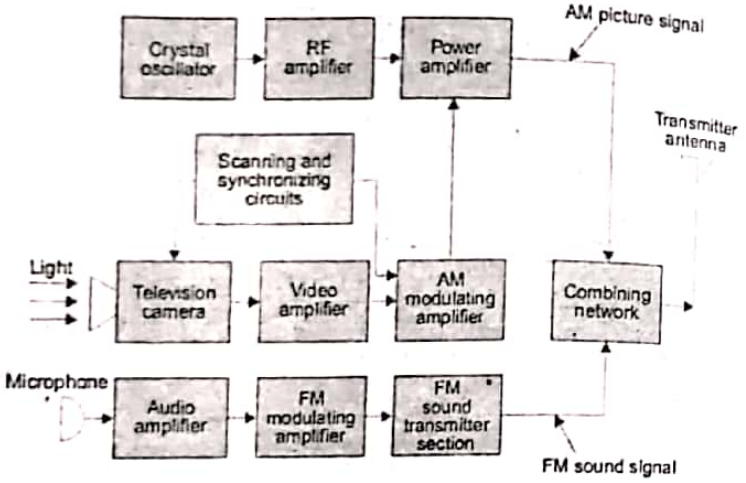


Fig. Elementray block diagram of monochrome television transmitter

The block diagram of monochrome TV receiver is shown below

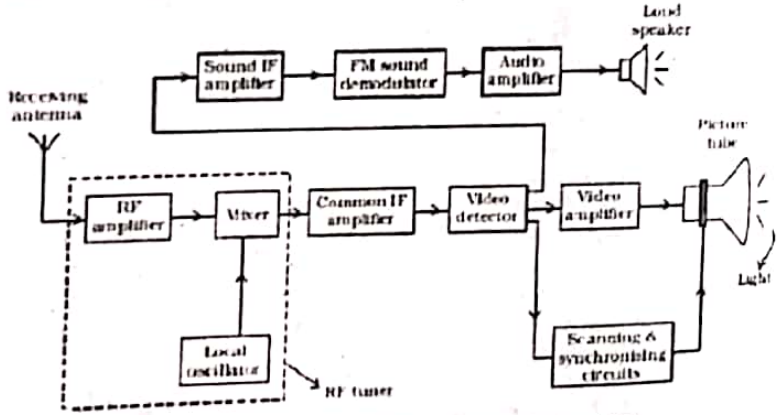


Fig. Elementary block diagram of a monochrome TV receiver

1.TV Receiving Aerial: The TV signal radiated by the transmitter has to be intercepted. For this an antenna with high gain, Broad Band, highly directional is used. Yagi-uda multi-element array is preferred. Impedance of the aerial should match the impedance of the transmission line. The aerial also selects the required signal and rejects unwanted signals.

2. Tuner: Also called RF Tuner/ Front end. Signals from Aerial are amplified, down converted to intermediate frequency. Band and channel selection is also carried out here. This is a separate, sealed and riveted unit mounted away from other circuits. Unit's body is grounded to avoid interference by other strong signals. Delayed AGC is used at RF amplifier.

3. VIF Amplifier: The output of RF Tuner has two intermediate frequencies i.e. video IF (38.9 MHz) and sound IF (33.5 MHz), occupying a band width of 7 MHz. Most of the amplification and selection is done here. This is also a separate, enclosed unit. Keyed AGC is used at the base of 1st IF Amplifier.

4. Video Detector: The output of VIF section is around 2 to $5V_{PP}$. This is fed to video detector to separate various signals i.e., video, AGC, inter carrier SIF. A special diode driven into saturation has many harmonics at its output. Using LPF, signals above 5 MHz are filtered out. OA 79, Ge, heavily doped, point contact diode is used for detection.

5. Video Output Amplifier: Output of video detector which is around 2 to 5 V_{PP} is amplified by a single stage broad band, voltage amplifier to give an output of 80 V_{PP}. Wave Trap is used to prevent 5.5 MHz inter – carrier SIF (38.9 – 33.4 MHz = 5.5 MHz) and disturb the picture. Output of this amplifier is fed to picture tube.

6. Picture Tube: This is a special type of CRT, having widescreen with wide deflection angle. Electromagnetic deflection and electro-static Focusing is used. H and V deflection coils moulded into a single unit 'Yoke' is mounted on the neck. Final anode is applied with Extra high Tension (EHT) which is around 12 to 18 kV. Screen is formed by long persistence P4 phosphor, which is a mixture of cadmium tungstate and zinc sulphide. The light radiated is Yellowish white. With proper output from syn section, picture is displayed on the screen.

7. Sync Section: Output of video detector which is composite video signal has H and V sync pulses either at top or bottom edges. By feeding video signal to sync separator, sync pulses can be separated. We can use clipper circuit when the video signal is with negative sync. Further, by using LPF, V- sync can be separated. Using HPF, H sync pulses can be separated. These pulses are used to synchronize the H and V saw-tooth oscillators. Output of these oscillators are amplified and used to drive the deflection coils on the picture tube.

8. Inter Carrier SIF Section: Output of detector has 5.5 MHz, which is the result of heterodyning between VIF and SIF (38.9 MHz – 33.4 MHz). This has frequency modulated Audio Signal. By using highly selective tuned circuit (sound-take-off coil), 5.5 MHz is separated. This is amplified and frequency demodulated to recover Audio signal.

9. Audio Section: Output from SIF section which is weak AF signal is amplified both in terms of voltage and power to drive the loud speaker. Finally, we get sound output.

10. Power Supply: Various levels of DC voltages are required for the operation of TV receiver. So, 230 V, 1 φ AC is rectified, filtered and regulated to provide ripple free steady voltage to various stages. However due to many advantages switch mode power supplied (SMPS) are widely used now-a-days. EHT and BHT required at picture tube is obtained from Auxiliary power supply using Line output transformer (LOT/EHT).

Q.4. (b) Draw and explain the diagram of scanning and EHT circuits (6)

Ans. Fields and Frames:

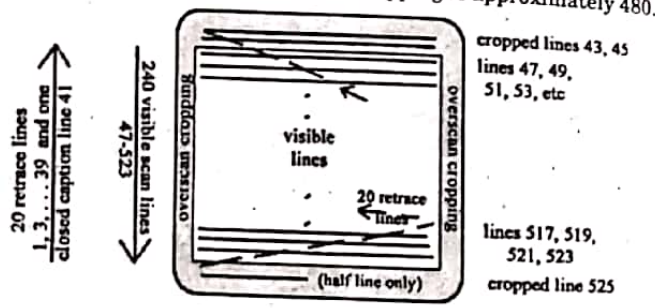
1. Moving Pictures (video) appears the same as real life - but in reality is a quickly displayed series of images, or pictures

2. Television camera's take 30 pictures each second

3. Movie camera's take 24 pictures each second - which are converted to 30 per sec for TV using Telecine
4. TV calls one picture a Frame - it breaks each frame up into two interlaced fields
5. The Television screen displays 60 fields each second
6. We define the 60 fields as 30 pairs of fields, and each pair is called a Frame
7. Therefore the Television screen displays 30 Frames each second (the exact number is 29.97- rounded off)
8. In reality, physically, there are no frames - it is a concept to denote one full image-what is scanned onto the screen is fields
9. Our eyes and brain meld the fields together so that we perceive it as smooth, flowing video

Scanned Horizontal Lines

1. Each Field is comprised of 262.5 horizontal lines which are scanned onto the screen, left to right,
2. Each line is scanned below the previous line
3. There is one odd Field (Field 1) and one even Field (Field 2)
4. The odd field scans lines 1, 3, 5, etc and the even field scans lines 0, 2, 4, etc . hence the term interlaced
5. The two field's interlaced lines mesh perfectly to create one full frame of lines 1,2,3,4, etc
6. There are 525 horizontal lines total in each frame, 262.5 lines per field - but only 91% of them are visible
7. The scanning beam is turned off for all invisible lines
8. 40 lines are for vertical retrace and are invisible, 2 lines are for closed captioning info and are also invisible
9. 483 lines are active - meaning the scanning beam is turned on
10. A few of the active lines (3 to 6 lines) are cropped
11. The final number of visible lines after cropping is approximately 480.



Field 1 Scanning (262.5 lines)

Q.5. Explain the features of composite Video Signal (CVS) at the end of even and odd fields. Also explain what is the need of pre & post equalizing pulses? (12.5)

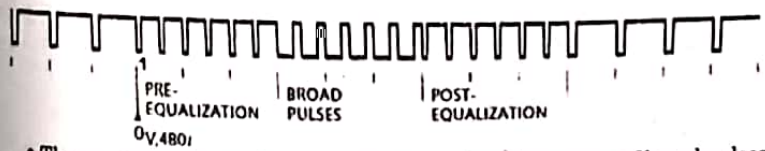
Ans. A signal that contains all three of these components — intensity information, horizontal-retrace signals, and vertical-retrace signals is called a composite video signal. A composite-video input on a VCR is normally a yellow RCA jack.

Common Features: The most common formats are NTSC-M and PAL-B/D/G/H/I (simplified in this document to PAL) and their fundamental characteristics are listed in the table below. NTSC uses the IRE unit of amplitude, where 1 IRE = 1/140 Volt or 7.1428 mV. * denotes a half-line.

	NTSC-M	PAL
Lines per frame	525	625
Field frequency (Hz)	59.94006	50
Line frequency (KHz)	15.73426576	15.625
Colour sub-carrier frequency (MHz)	3.57954546	4.43361875
Analogue video bandwidth (MHz)	4.2	5
Nominal RF bandwidth (MHz)	6	8
Nyquist interval (ns)	125	100
Blanking level (mV)	0	0
Peak white level (mV)	714.3(100 IRE)	700
Sync level (mV)	-285.7(-40 IRE)	-300
Black (setup) level (mV)	53.57(7.5 IRE)	0
Burst amplitude peak-to-peak (mV)	285.7(40 IRE)	300
Nominal peak-to-peak (mV)	1000	1000
Line period (µs)	63.555556	64.0
Total samples per line	1272	1280
Active picture samples per line	1044	1040
Pulse rise/fall time (ns)	140	200
Field period (ms)	16.68333	20.0
Vertical blanking lines	1 to 20263* to 283*	623* to 23*311 to 335
Odd field active picture lines	21 to 263*	23* to 310
Even field active picture lines	283* to 525	336 to 623*
Odd field lines	1 to 263*	1 to 313*
Even field lines	263* to 525	313* to 625
	(264 is line 1)	(314 is line 1)

Equalization Pulses:

- Equalization pulses are unrelated to the process of equalization that is used to compensate poor frequency response of coaxial cable, or poor frequency or phase response of a filter.
- Analog sync shown in diagram illustrates the development of the combined (vertical and horizontal) sync waveform.
- Every line outside the vertical interval starts with a normal sync pulse having a duration of 4.7 µs. Vertical sync is identified by a sequence of broad pulses, each having a duration of half the line time less a full sync width.
- The broad pulses are serrated so that a receiver can maintain horizontal sync during the vertical interval.
- When analog sync separators comprised just a few resistors and capacitors, imperfect vertical sync separation was prone to exhibit line pairing, where scan lines from the second field were not laid exactly halfway between lines of the first field.
- Line pairs were prone to be visible. Achieving good interlace required interposing narrow equalization pulses, each having half the duration of normal sync, between line syncs.



- There are three lines of pre-equalization pulses, three lines of broad pulses, and three lines of post-equalization pulses.

• In 480i, line 1 and 0V are defined by first equalization pulse of a field. (In other scanning standards, including HDTV, line 1 and 0V are defined by the first broad pulse of a field, or frame.)

• The first field in 480i was historically denoted odd, and the second field was historically denoted even. Historically, 0V was defined for each field, and lines were numbered from 1 in each field.

Nowadays, 0V for the second field is largely irrelevant, and lines are numbered through the frame. 0V for the 480i frame is defined by first equalization pulse coincident with 0H.

UNIT-III

Q.6. (a) Write short note on PAL system.

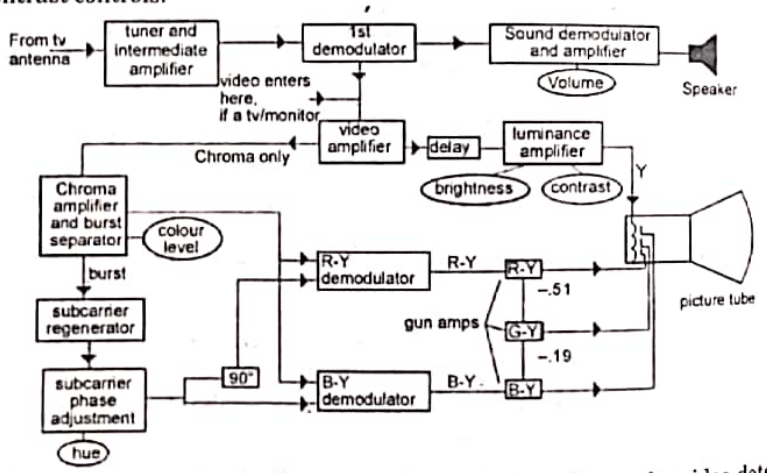
Ans. In a colour television receiver, additional circuits are provided to deal with the colour. (6.5)

The only difference in the IF circuit is the importance of bandwidth for colour receivers. Remember that video frequencies around 3.58 MHz just show details in monochrome, but these frequencies are essential for colour information. Without them, there is no colour. This is why the fine tuning control on colour television sets must be tuned exactly, or else the colour disappears, along with the higher resolution.

The sound is usually taken off before the video detector in colour sets, and a separate converter is used for it, instead of taking it from the video detector. The reason that this is done is to minimize a 920 KHz beat signal that can result between the 3.58 MHz colour subcarrier and the sound carrier signal. This signal would show up as interference in the television picture.

The output from the video detector is sent to two places: a series of colour circuits, and a luminance output amplifier.

The luminance amplifier also serves as a cutoff filter for frequencies above 3.2 MHz, thus removing all colour information from the luminance video signal and, alas, some of the sharpness and detail. On this amplifier is where you will find your brightness and contrast controls.



In the colour recovery circuits, several things happen. First, the video detector's output is sent through a colour "band pass" filter, which leaves us with just the chrominance information - the luminance has been removed. This chroma output contains both the colour information for the picture, and the colour burst. It is then sent to a burst separator to detect the phase and level of the colour burst. This is where you will find your "colour" control. Now we'll have a reference for the colours within the picture, which is sent

to a crystal oscillator which generates constant 3.58 MHz subcarrier of the correct phase. This oscillator's phase can be adjusted - this is your hue control. The oscillator is used with two colour demodulators to recover the R-Y and B-Y colour difference signals. The continuous wave subcarrier is delayed by 90 degrees of phase before it enters the R-Y demodulator. The R-Y and B-Y signals are combined further to recover the G-Y signal. All three signals are then sent to the colour picture tube's grids. There, they are combined with three luminance drive signals in the correct proportions, giving us our familiar RGB signals for driving the electron guns within the picture tube to re-create the colour television picture.

Q.6. (b) What do you understand by Luminance signal and chrominance signal? (6)

Ans. Luminance is a weighted sum of the three colors of light used in color television and computer displays - which are Red, Green and Blue - at a given point on the screen. A stronger Luminance signal indicates a more intense brightness of light at a given spot on the screen.

Chrominance describes the frequency of light at a given point on the screen, or in more common terms, the color of the light to be produced at a given point. The Chrominance signal specifies what color is to be shown at a given point on the display as well as how saturated or intense the shade of color that is shown. Combinations of Red, Green and Blue light produced by the video display are able to deceive the human eye into perceiving the full range of visible colors, even though only three narrow ranges of frequencies in the visible spectrum can actually be generated by the video display. (This is reasonable, since the human eye only detects light frequencies centered around what we perceive as Red, Green and Blue, although human sensitivity to wavelengths of light is greater than the narrow wavelengths that the typical video display generates.)

Together, Luminance indicates how bright a given location on the screen is, and Chrominance specifies how close to not having a color (just being "White"), or how intense the shade of color at the brightness specified by the Luminance should be.

Those familiar with printing or painting might wonder why Red, Yellow and Blue are not used in video, since these colors are usually stated (incorrectly) to be the primary ink colors. (They are really Magenta, Yellow and Cyan.) The difference is due to the fact that video is an additive light process, where light at the frequencies of Red, Green and Blue are combined to make what appears to the eye to be "White". In printing, you start with White paper and Magenta, Yellow and Cyan inks mask and take away reflectivity from the White paper, a process known as the Subtraction of Colors. Photographic film (also a subtractive system) also employ Magenta, Yellow, and Cyan dye layers.

For Addition of Colors, such as that found in lighting, things are different. Theater lighting designers had discovered many years ago that Green had to be used (instead of Yellow) with Red and Blue lights in order to obtain a more natural White area illumination when using border or "strip" lighting. Yellow, Red and Blue light combined tends to produce an Orange color, although part of this is due to the use of tungsten lighting, which already has a yellow bias. This experience was likely made known to the developers of color television. The fact that the cone in the human eye that detects the middle frequencies of visible light is more centered around wavelengths that are considered to be "green" light rather than yellow light was also a factor.

The three colors (Red, Green and Blue) found in color television are not used evenly to compute the Luminance value. This is because the human eye is much more sensitive to some frequencies of light than others. Green light, with a wavelength of 500nm or so, is detected by the human eye far more easily than the extremes of the visible spectrum, as in Red (approximately 700nm) and Violet (approximately 400nm). This unbalanced sensitivity must be replicated by color video systems to allow reproduced images to appear natural.

Studies into the sensitivity of the human eye and the sensitivity of black and white film to various frequencies of light were all used by the designers of the NTSC color television system in deciding what combination of Red, Green and Blue intensities should be considered to be "White".

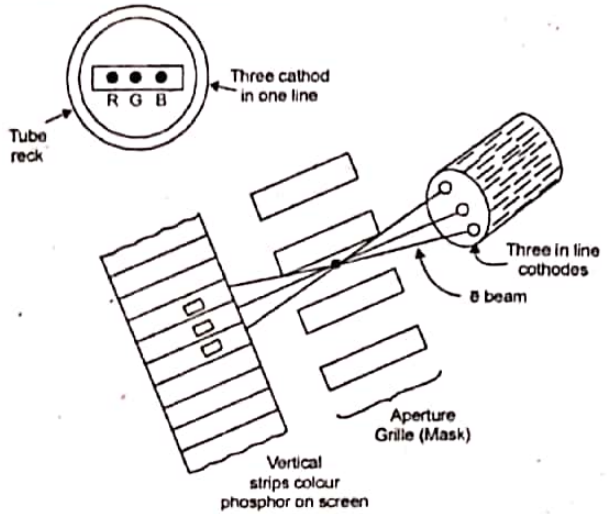
Q.7. Explain the construction and working principle of Trintiron and PIL colour picture tubes. Compare their features. **(12.5)**

Ans. Working Principle of Trinitron Picture Tube: Trinitron or three-in-line cathodes. This picture tube was developed by 'Sony' corporation of JAPAN around in 1970. It employs a single gun having three in line cathodes. This simplifies the construction problem since Three electron gun assembly is to be accomodated.

Three phosphor triads are arranged in vertical strips as in precision-in-line picture tube.

A metal aperture grille like mark is provided very close to the screen. It has one vertical slot for each phosphor triad.

Three beams are bent by an electrostatic lens system. So appear to emerge from the same fiat in the lens assembly.

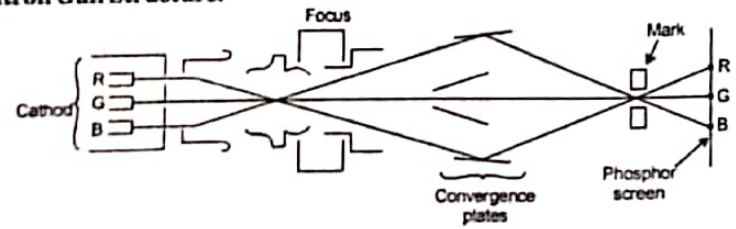


Since the beans have a common focus plans, a sharper image is obtained with good focus over the entire picture area. All this simplifies convergence problems to fewer adjustments are necessary the logic schematic for the trinitron picture tube is as show below.

Refined version of trinitron picture tube came into existance in year 1978. It incorporates a low magnification electron gun assembly, long focusing electrodes a and large aperture lens system.

The new high precision deflection yoke with minimum consergence adjustments provides a high quality picture with very good resolution over large screen display tube.

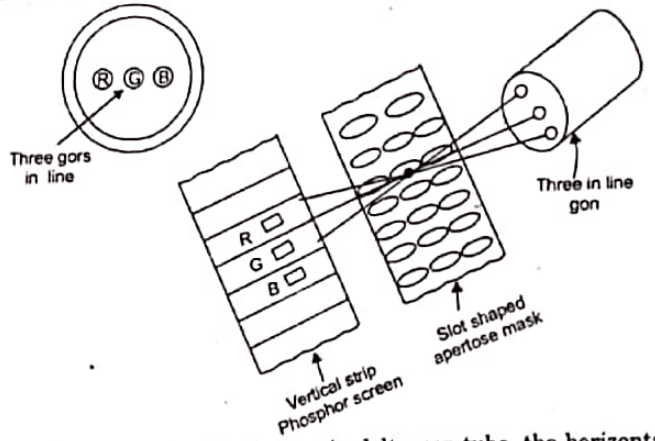
Trinitron Gun Structure:



Precision-in-line (PIL) Colour Picture Tube

In this type of picture tube following important feature exist.

1. There are three different gun for each colour separately.
2. These guns are alligned precisely in horizontal line.
3. This in line gun configuration helps in simplyfying the convergence adjustments.



To obtain the same colour fineness as in delta-gun tube, the horizontal spacing between the strips of same colour is made equal to that of the triads of dots in case of delta-gun picture tube.

PIL Picture tube is more efficient e.g. it has more electron transparency and it requires fewer convergence requirement because of inlined electron gun structure.

UNIT-IV

Q.8. (a) Explain the construction and working of FAX machine. **(6.5)**

Ans. The way that a fax machine works is very simple. You dial a number, place the page you want to send in the machine, press "start", and off they go, at about less than a minute a page. However, if you want to know more, the following will provide you more details.

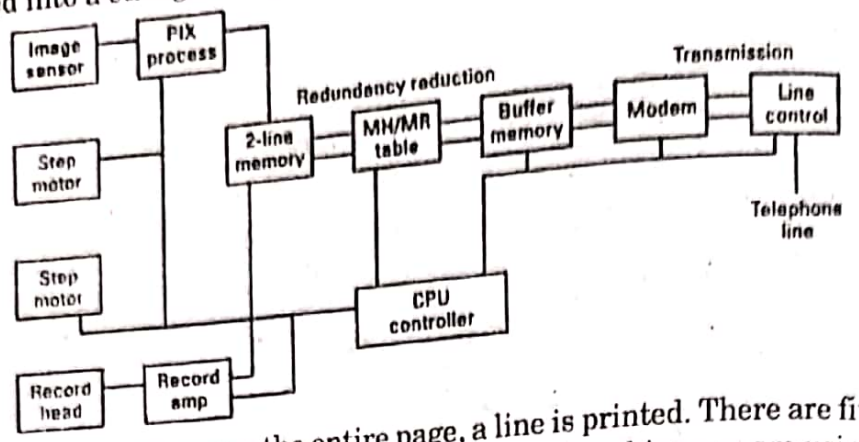
A fax machine scans an image by reading a very small area of the image at a time. It is like human eyes scanning across a page when reading, but only done electronically and much faster than most people do. It does not recognize the printed letters but reads the small black dots that form each character.

The machine decides whether the area it is reading is light or dark and assigns the area a number such as "0" for white and "1" for dark. It then transmits the number to a remote facismile receiver via telephone lines. The receiver makes a mark on paper corresponding to the area on the original image. This process continues as the transmitting machine scans a series of small areas horizontally across the image, and transmits that information to the remote receiver. The transmitting fax then scans the next lower line and so on until the entire image has been scanned, digitized, and transmitted. One full line of text usually takes 10 to 20 additional scanning lines. A whole page usually comprises 22000 scanning lines at fine resolution.

A typical Group 3 fax machine is shown as a block diagram as given below:

The technique to bring this process about uses as electronic eye to convert the image on the page into electrical signals. Tones are produced by a moderm to sent the information over a telephone fine. The modem then takes a group of 16 successive digital numbers and sends only one symbol to the fax receiver to achieve faster

transmission. The symbols follow each other 2400 times a second as a signal. If you listen to a telephone while the fax is transmitting an image, you would hear a hissing sound that is similar to the noise produced by an AM radio tuned between stations. At the fax receiver, the transmitter processes are reversed and each digital number is transformed into a string of dots.



After the dots reach across the entire page, a line is printed. There are five different ways to print the received fax depending on the type of machine you are using. They are : Thermal paper–used since 1980, coated with chemicals that react to heat by turning black; Thermal film-contains ink that melts onto paper heated; Inkjet–same technique as an inkjet printer; Laser printer–same mechanism as a laser printer; Computer printer–after data received by a fax modem, it's stored on the computer's hard disk as a graphics file then printer out via computer's usual printer.

Q.8. (b) Write short note on fuzzy logic washing machine. (6)

Ans. Refer question no. 8.(b) of End Term 2018. (Page No. 14-2018)

Q.9. (a) Explain the RFID and Bluetooth technology. (6.5)

Ans. Refer question no. 9.(b) of End Term 2018. (Page No. 16-2018)

Q.9. (b) Distinguish between LCD & Plasma TV. (6)

Ans. LCD TV vs Plasma TV

Difference in Picture Quality: Here is how LCD and Plasma TVs stack up in terms of all the various elements that determine picture quality.

Contrast Ratio: Contrast ratio is a measure to compare the darkest black with the whitest white. Plasma TVs score well on this parameter with a contrast ratio of up to 3000:1. LCD TVs have a contrast ratio of up to 1000:1; however, this metric is calculated differently for LCDs so it's not an apples-to-apples comparison. Plasma TVs, in general, offer a better contrast than LCDs.

Burn-in: Older models of Plasma TVs can suffer from burn-in produced by static images. After extended periods, stationary images 'burn in' the screen and produce an after-image ghost which remains permanently on the screen. This no longer affects new Plasma displays, as they continually shift the image around to prevent the image from being stationary.

Deeper Blacks in Plasma TVs: Plasma TVs are capable of displaying deeper blacks. Improved black levels help render better those difficult-to-define quality attributes like picture depth, scene detail - especially in television and movie scenes where lots of dark and light content is shown simultaneously, and color richness. Indirectly, a better black level also leads to better rendering of picture contrast.

Color in Plasma vs. LCD screens: LCD TV displays reproduce colours by manipulating light waves and subtracting colours from white light. This makes it more difficult for maintaining colour accuracy and vibrancy. But, LCD TVs have colour information benefits from the higher-than-average number of pixels per square inch found in their displays.