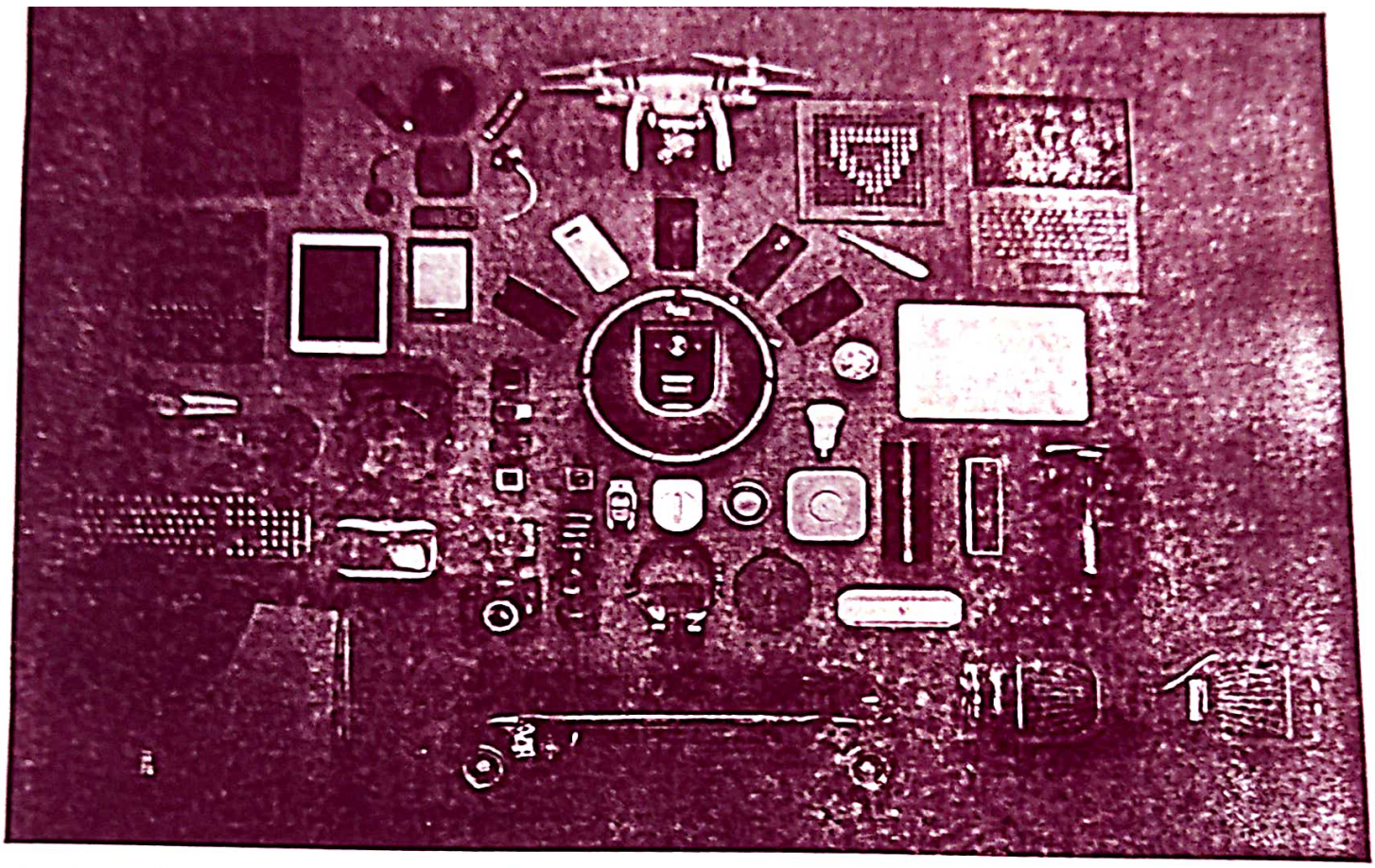


CONSUMER ELECTRONICS

SYLLABUS

Chapter	Name of the Topic	Hours
Unit I	**Audio Fundamentals and Devices** Basic characteristics of sound signal, Audio level metering, decibel level in acoustic measurement Microphone & Types, speaker types & working principle, Sound recording principle & types.	12
Unit II	**Audio Systems** CD player, home theatre sound system, surround sound, Digital console block diagram, working principle, applications, FM tuner , ICs used in FM tuner TDA 7021T , PA address system.	12
Unit III	**Television Systems-** Monochrome TV standards, scanning process, aspect ratio, persistence of vision and flicker, interlace scanning, picture resolution, Composite video signal, Colour TV standards, colour theory, hue, brightness, saturation, luminance and chrominance, Different types of TV camera, Transmission standards.	14
Unit IV	**Television Receivers and Video Systems-** PAL-D colour TV receiver, Digital TVs:- LCD, LED , PLASMA, HDTV, 3-D TV, projection TV, DTH receiver, Video interface, Digital Video, SDI, HDMI Multimedia Interface, Digital Video Interface, CD and DVD player.	12
Unit V	**Home / Office Appliances** Diagrams, operating principles and controller for FAX and Photocopier, Microwave Oven, Washing Machine, Air conditioner and Refrigerators, Digital camera and camcoder.	10
	TOTAL	60

UNIT 01

AUDIO FUNDAMENTALS AND DEVICES

Q.1. What are the characteristics of a sound wave(single)?

Ans. The five main characteristics of sound waves include:

1. Wavelength
2. Amplitude
3. Frequency
4. Time period
5. Velocity.

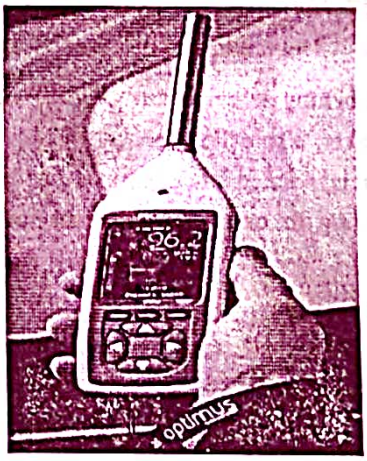
1. **Wavelength:** The most important characteristic of sound waves may be the wavelength. Sound consists of a longitudinal wave that includes compressions and rarefactions as they travel through a given medium. The distance that one wave travels before it repeats itself is the wavelength. It is the combined length of a compression and the adjacent rarefaction, or the distance between the centers of two consecutive rarefactions or compressions.
2. **Amplitude:** The amplitude is the size of a given wave. Think of it as sort of like the wave's height as opposed to its length. The amplitude is more accurately defined as the maximum displacement of the particles the sound wave disturbs as it passes through a medium.
3. **Frequency:** The frequency refers to the number of sound waves a sound produces per second. A low-frequency sound has fewer waves, while a high-frequency sound has more. Sound frequency is measured in hertz (HZ) and is not dependent upon the medium the sound is passing through.
4. **Time Period :** The time period is almost the opposite of the frequency. It is the time required to produce a single complete wave, or cycle. Each vibration of the vibrating body producing the sound is equal to a wave.
5. **Velocity:** Finally, the velocity of the wave, somet imes referred to as the speed, is the amount of distance in meters per second that a wave travels in one second.

Q.2. Explain sound level meter ?

Or. Write the working of sound level meter ?.

Ans. Sound level meters are used to measure and manage noise from a variety of sources, including industrial plants, road and rail traffic, and construction work. With the addition of typical urban situations, such as concerts, leisure parks, and residential and commercial neighbors, the many different sources of sound and different characteristics, pose a variety of challenges for the professionals who assess them.

Working of sound level meter: A sound level meter comprises a microphone, a preamplifier, signal processing, and a display. The microphone converts the sound signal to an equivalent electrical signal. The most suitable type of microphone for sound level meters is the condenser microphone, which combines precision with stability and reliability.



The electrical signal produced by the microphone is at a very low level, so it is made stronger by a preamplifier before it is processed by the main processor. Signal processing includes applying frequency and time weightings to the signal as specified by international standards such as IEC 61672 – 1, to which sound level meters conform.

Q.3. Describe level in acoustic measurement Microphone and explain its types.

Ans. ***Sound Level Measurement :*** Sound level is a logarithmic measure of the effective sound pressure of a sound relative to a reference value. It is measured in decibels (dB) above a standard reference level. Sound level math allows calculation of the typical parameters for sound level measurements

from a single microphone. It allows Dewesoft to be used as a Class I sound level meter

Types of Acoustic measurement microphone:

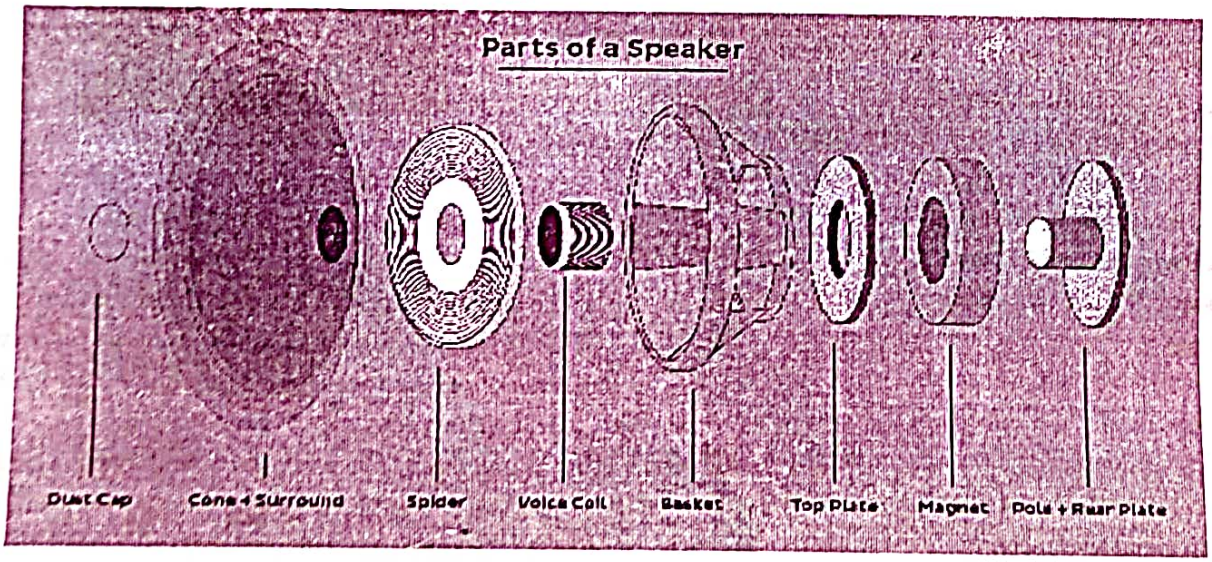
1. **Sound Pressure Level:** The sound is a mechanical wave which is an oscillation of pressure transmitted through a medium (like air or water), composed of frequencies within the hearing range. The human ear covers a range of around 20 to 20 000 Hz, depending on age. Frequencies below we call sub-sonic, frequencies above ultra-sonic. Sound needs a medium to distribute and the speed of sound depends on the media:
   in air/gases: 343 m/s (1230 km/h)
   in water: 1482 m/s (5335 km/h)
   in steel: 5960 m/s (21460 km/h)

   If an air particle is displaced from its original position, elastic forces of the air tend to restore it to its original position. Because of the inertia of the particle, it overshoots the resting position, bringing into play elastic forces in the opposite direction, and so on.
2. **Wavelength and frequency:** A sine wave is illustrated in the image below. The wavelength ω is a spatial period of the wave - the distance over which the wave's shape repeats. The wavelength can be measured between successive peaks or between any two corresponding points on the cycle. This is also true for any other periodic wave. The frequency f specifies the number of cycles per second, measured in hertz (Hz).
3. **Sound pressure:** Sound pressure or acoustic pressure is the local pressure deviation from the ambient (average, or equilibrium) atmospheric pressure, caused by a sound wave. In the air, sound pressure can be measured using a microphone and in water with a hydrophone. The SI unit for sound pressure p is the pascal (symbol: Pa).
4. **Sound pressure level:** Sound pressure level (SPL) or sound level is a logarithmic measure of the effective sound pressure of a sound relative to a reference value. It is measured in decibels (dB) above a standard reference level. The standard reference sound pressure in an air or other gases is 20 μPa, which is usually considered the threshold of human hearing (at 1 kHz). The following equation shows us how to calculate the Sound Pressure level (Lp) in decibels [dB] from sound pressure (p) in Pascal [Pa].

Q.4. Explain working principle and parts of speaker and also explain the various types of speaker.

Ans. Loudspeaker, also called speaker, in sound reproduction, device for converting electrical energy into acoustical signal energy that is radiated into a room or open air. The term signal energy indicates that the electrical energy has a specific form, corresponding, for example, to speech, music, or any other signal in the range of audible frequencies (roughly 20 to 20,000 hertz).

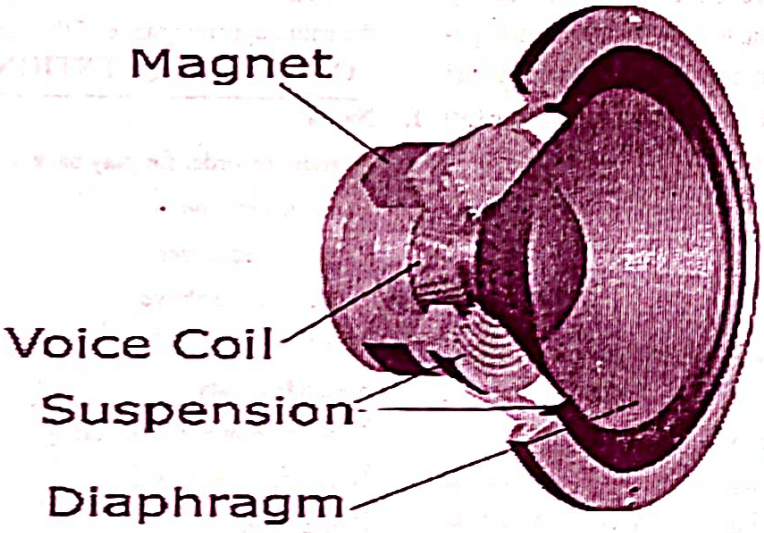
Parts of a speaker:



The parts of a speaker are:

1. The cone and the dust cap (the parts that move air and produce sound)
2. The spider and the surround (also called the suspension, these are the parts that hold the cone in place while still allowing them to move)
3. The magnet and the voice coil (the parts that interact to convert electric energy into motion)
4. The basket
5. The pole and top plate
6. And finally the frame that mounts everything together

Working principle of Speakers : Speakers work by converting electrical energy into mechanical energy (motion). The mechanical energy compresses air and converts the motion into sound energy or sound pressure level (SPL).



When an electric current is sent through a coil of wire, it induces a magnetic field.In speakers, a current is sent through the voice coil which produces an electric field that interacts with the magnetic field of the permanent magnet attached to the speaker.

Like charges repel each other and different charges attract. As an audio signal is sent through the voice coil and the musical waveform moves up and down, the voice coil is attracted and repelled by the permanent magnet. This makes the cone that the voice coil is attached to move back and forth. The back and forth motion creates pressure waves in the air that we perceive as sound.

The Different Types of Speakers:

1. Tower / Floor Standing Speakers.
2. Bookshelf Speakers.
3. Surround Speakers / Satellite Speakers.
4. Center-Channel Speakers.
5. Subwoofers
6. Soundbars are the easiest way to improve your TV audio quality.
7. In-Wall Speakers.

Q. 5. Define the principle of Sound recording.

Ans. Sound recording, transcription of vibrations in air that are perceptible as sound onto a storage medium, such as a phonograph disc. In sound reproduction the process is reversed so that the variations stored on the medium are converted back into sound waves.

The three principal media that have been developed for sound recording and reproduction are the:

1.Mechanical (phonographic disc)
2.Magnetic (audiotape)
3.Optical (digital compact disc) systems.

1. **The phonograph disc:** A monaural phonograph record makes use of a spiral 90° V-shaped groove impressed into a plastic disc. As the record revolves at 33 1/3 rotations per

minute, a tiny "needle," or stylus, simultaneously moves along the groove and vibrates back and forth parallel to the surface of the disc and perpendicular to the groove, tracing out the sound wave. The upper end of the stylus is connected to a tiny magnet, which moves back and forth through a small coil, inducing an electrical voltage that re-creates the recorded sound wave. The rate of oscillation of the stylus determines the frequency of the sound, while the amplitude of the oscillation determines its loudness.Just as the use of two eyes creates a perception of depth, so can the effect of musical "presence" be achieved by stereophonics, recording music with two appropriately positioned microphones and playing it back on two separated loudspeakers. A stereophonic recording provides the two separate signal channels as oscillations perpendicular to either one or the other of the faces of the record groove.

2. **The audiotape:** Audiocassette tape recording also makes use of electromagnetic phenomena to record and reproduce sound waves. The tape consists of a plastic backing coated with a thin layer of tiny particles of magnetic powder, usually ferric oxide (Fe_2O_3) and to a lesser extent chromium dioxide (CrO_2). The recording head of the tape deck consists of a tiny C-shaped magnet with its gap adjacent to the moving tape. The incoming sound wave, having been converted by a microphone into an electrical signal, produces a time-varying magnetic field in the gap of the magnet. As the tape moves past the recording head the powder is magnetized in such a way that the tape carries a record of the shape of the wave being recorded. The frequency of the impressed signal determines the distance along the tape over which the impressed magnetic field must be reversed, and the amplitude of the signal determines the extent of the magnetization of the tape.

3. **The compact disc:** The compact disc, or digital disc, uses digital technology to avoid or mitigate some of the technical problems and requirements inherent in phonograph and audiotape recording. Whereas both phonograph recordings and audiotape have limited dynamic range and frequency response, the compact disc has both a greater dynamic range—ideally, over 90 decibels—and a linear frequency response from less than 20 hertz to over 20,000 hertz—greater than that of the human ear.

Digital recording uses sampling of the sound wave at a series of points at equal time intervals along the wave to approximate the full wave. In order to maintain frequency response up to 20 kilohertz, the limit of human hearing, it is necessary to sample at slightly above twice that frequency, so that compact discs actually have a sample rate of 44.1 kilohertz. The signal level is divided into 215 (about 32,000) equal intervals. With such a large number of intervals being employed, both large and small wave intensities can be reproduced accurately. Indeed, intensity variations of less than one decibel (the approximate value of the intensity just noticeable difference of the ear) can be achieved over the entire dynamic range of the compact disc.

OBJECTIVE QUESTIONS ANSWERS

1. **Nagra**

A. audio recorder for play back

B. music notation

C. graphic equalizer

D. none of the above

Answer: A.

2. **Sound Intensity**

A. sound power per unit area

B. recording standard

C. high volume

D. none of the above

Answer: A.

3. **Hz stands for**

A. short for hertz

B. brand name of audio equipment

C. number of recording console

D. none of the above

Answer: A.

4. **Ultrasonic**

A. audio frequencies which are too high to be heard by humans

B. audio frequencies which are too low to be heard by humans

C. audio frequencies which are compatible to natural sound

D. none of the above

Answer: A.

5. graphic EQ
   A. graphic equalizer
   B. graphic design
   C. graphical picture of sound wave
   D. none of the above

Answer: A

6. Surround sound
   A. multi-channel audio playback systems
   B. sound from surroundings
   C. back ground music
   D. none of the above

Answer: A

7. MIDI
   A. encoding format B. editing console
   C. audio system D. none of the above

Answer: A

8. Audio file formats
   A. mpeg-3 B. tiff
   C. jpeg D. gif

Answer: A

9. Plug-ins
   A. accessory downloads to improve the functionality
   B. audio cable
   C. xlr connector
   D. none of the above

Answer: A

10. Microphone
   A. converts sound to an electric signal
   B. smallest phone
   C. smart phone
   D. none of the above

Answer: A

11. Sound is transmitted through gases, plasma, and liquids as
   A. longitudinal waves
   B. mechanical waves
   C. light waves
   D. none of the above

Answer: A

12. Sound cannot travel through a
   A. vacuum B. medium
   C. gas D. plasma

Answer: A

13. The matter that supports the sound is called the _____
   A. vacuum B. medium
   C. equipment D. signal

Answer: A

14. Radio is categorized as a _____ media
   A. mass media B. visual media
   C. print media D. none of the above

Answer: A

15. The microphone that picks up sound from both sides is called
   A. omni directional B. bi directional
   C. shot gun D. lapel

Answer: B

16. Human hearing dynamic range is
   A. 140db B. 500db
   C. 250db D. 1000db

Answer: A

17. A decibel is one tenth of a _____
   A. bel B. hz
   C. bi D. byte

Answer: A

18. FM radio
   A. frequency modulation
   B. frequent media
   C. frequency meter
   D. none of the above

Answer: A

19. Audio console
   A. audio mixing B. non linear editing
   C. broadcasting D. none of the above

Answer: A

20. Video program is often structured for a _____ audience format
   A. passive B. active

C. restrictive D. none of the above

Answer: D.

21. Resolution is usually expressed in _____

A. twips B. inches

C. points D. pixels

Answer: D.

22. The smallest addressable screen element is called?

A. pixel B. voltage level

C. graph D. color information

Answer: A

23. Vector graphics

A. lines B. bitmaps

C. pixel D. none of the above

Answer: A

24. Media

A. concept of a work of art

B. materials used to create art

C. mood in art

D. none of the above

Answer: B

25. Intensity

A. the saturation or strength of a color

B. the band of individual colors

C. factors of hue, value, and intensity

D. a hue at a darker value

Answer: A.

26. Aspect ratio

A. ratio of width and height

B. ratio of width and depth

C. ratio of width and diagonal

D. none of the above

Answer: A.

27. HD format

A. high definition B. high density

C. high-tec digital D. none of the above

Answer: A.

28. Interactive media

A. responds to users action

B. linear media

C. print media

D. none of the above

Answer: A.

29. Sound wave

A. pressure wave B. sound of wave

C. high sound D. none of the above

Answer: A.

30. Type of Audio visual media

A. web casting B. still photo

C. print media D. none of the above

Answer: A.

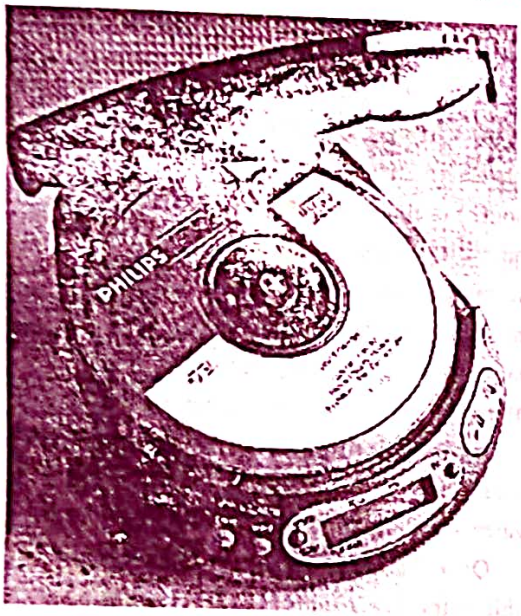
UNIT 02

AUDIO SYSTEM

Q. 1. Explain CD Player and its inner working.

Or. Describe the working principle of CD player ?

Ans. A CD player is an electronic device that plays audio compact discs, which are a digital optical disc data storage format. CD players were first sold to consumers in 1982.



CDs typically contain recordings of audio material such as music or audiobooks. CD players may be part of home stereo systems, car audio systems, personal computers, or portable CD players such as CD boomboxes. Most CD players produce an output signal via a headphone jack or RCA jacks. To use a CD player in a home stereo system, the user connects an RCA cable from the RCA jacks to a hi-fi (or other amplifier) and loudspeakers for listening to music. To listen to music using a CD player with a headphone output jack, the user plugs headphones or earphones into the headphone jack.

Inner Working of CD Player: The process of playing an audio CD, touted as a digital audio storage medium, starts with the plastic polycarbonate compact disc, a medium that contains the digitally encoded data. The disc is placed in a tray which either opens up (as with portable CD players) or slides out (the norm with in-home CD players, computer disc drives and game consoles). In some systems, the user slides the disc into a slot (e.g., car stereo CD players). Once the disc is loaded into the tray. the data is read out by a mechanism that scans the spiral data track using a laser beam. An electric motor spins the disc. The tracking control is done by analogue servoamplifiers and then the high frequency analogue signal read from the disc is digitized, processed and decoded into analogue audio and digital control data which is used by the player to position the playback mechanism on the correct track, do the skip and seek functions and display track, time, index and, on newer players in the 2010s, display title and artist information on a display placed in the front panel.

Q.2. Describe the home theater sound system.

Ans. Home theater is difficult to define -- it's really just a vague term for a particular approach to home entertainment. Generally speaking, a home theater system is a combination of electronic components designed to recreate the experience of watching a movie in a theater. When you watch a movie on a home theater system, you are more immersed in the experience than when you watch one on an ordinary television.

To see how home theaters do this, let's take a look at the original model -- the movie theater. When it comes to picture and sound, the theater can offer an amazing experience we just don't get at home. That's usually why people will pay to go to the movies, even though renting a movie is cheaper. There are a few main components that make watching TV and going to the movies very different.

One of the biggest differences is the sound experience. When you go to see a movie in a quality movie theater, you'll hear the music, sound effects and dialogue not just from the screen, but all around you. If you've read How Movie Sound Works, you know that a standard movie theater has three speakers behind the screen -- one to the right, one to the left and one in the center -- and

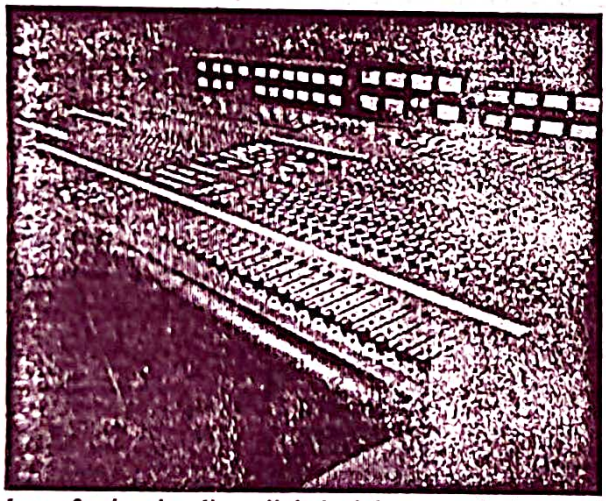
several other speakers spread out in the rest of the theater. In this surround sound system, you hear different parts of the soundtrack coming from different places. When somebody on the left side of the screen says something, you hear it more from the left speaker. And in a movie like "Star Wars," you hear a rumbling swoosh travel from the front of the theater to the rear as a spaceship flies toward the camera and off the screen. You are more involved in the experience of watching a film because the world of the movie is all around you.

Q.3. What does Surround Sound Mean ?

Ans. Surround sound is a technology that is used for enriching the quality of audio reproduction for listeners by using additional audio channels. Unlike screen channels, the sound produced by surround sound technology is from a 360° radius in the two-dimensional plane. Surround sound uses multiple channels, with each channel having a dedicated speaker within the system. Surround sound provides listeners with excellent audio ambiance and richer and fuller sound.

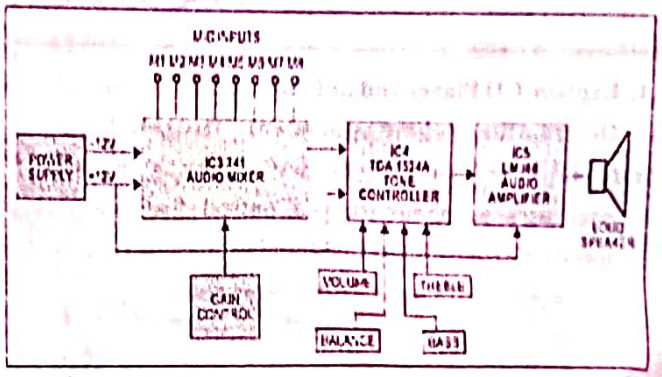
Q. 4. Explain the working principle of digital console with block diagram and also write its application.

Ans.



In professional audio, a digital mixing console (DMC) is a type of mixing console used to combine, route, and change the dynamics, equalization and other properties of multiple audio input signals, using digital signal processing rather than analog circuitry. The digital audio samples, which is the internal representation of the analog inputs, are summed to what is known as a master channel to produce a combined output. A professional digital mixing console is a dedicated desk or control surface produced exclusively for the task and is typically more robust in terms of user control, processing power and quality of audio effects. However, a computer can also perform the same function since it can mimic its interface, input and output.

Block Diagram of Digital Console:



How A Mixing Console Works: Almost all mixing desks have a similar signal path. First, the input signal from a line source or microphone is sent through a line buffer or mic amplifier where the signal level is optimized for noise performance and headroom. After that, it passes through the mixer's equalizer before reaching the channel fader. Auxiliary outputs will usually be located immediately before or after the fader as well as insert points where the signal can be extracted from the mixer, processed though another device –such as effects pedals, external compressors or noise gates – and then returned to continue through the mixer.

Once this is done, the signal is then moved to the available outputs or groups as needed. In the case of the latter, there may be an additional equalizer phase in the groups before the signal reaches the fader, and further routing to the mixer's main outputs. The reason for the grouping ability is to make it easier to control a large number of signals at once or to allow a single signal processor to work on a number of channel signals simultaneously. That's pretty much how mixers work in simple terms but let's check out each phase individually to get an even deeper understanding.

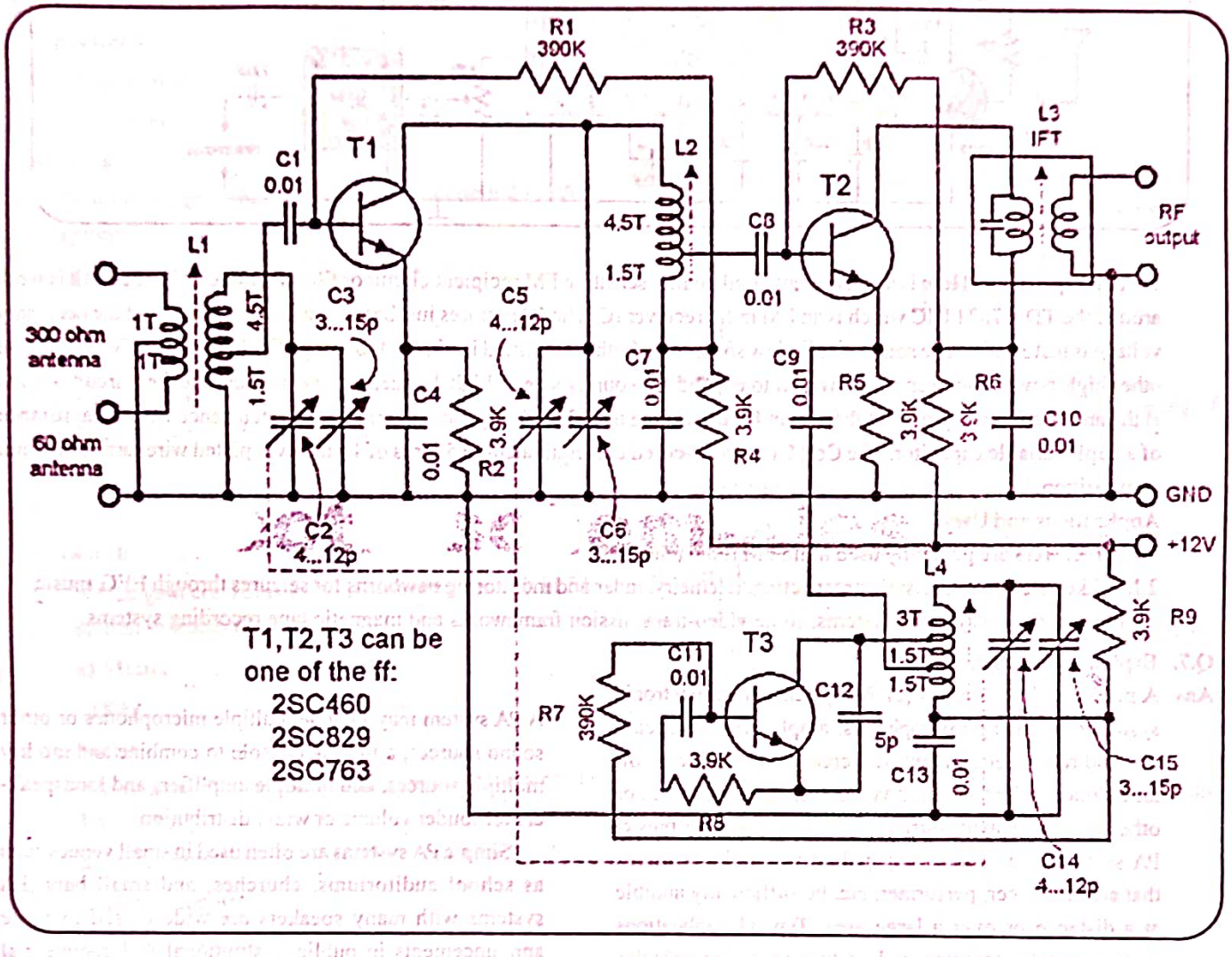
Application: An application that uses the command line for input and output rather than a graphical ..terface (GUI). For example, utility programs that perform a single function or that run in the background are often written as console apps.

Q.5. Explain FM Radio Tuner and draw its Circuit diagram ?

Ans. The fm tuner circuit is designed with only 3 transistors.

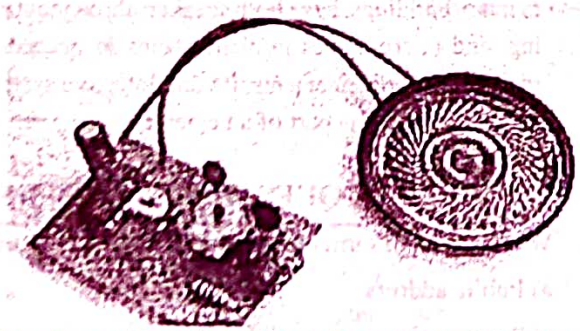
The amplification is around 40 dB. The first transistor works as an RF amplifier. The second transistor is the mixer. The incoming signal is introduced into the base and the oscillator signal is coupled to the emitter. The third transistor is the oscillator. The coils are wind around 6 mm coil formers with a ferrite core. The best material for the coils is a silver coated copper wire since it is very easy to be tapped. The distance between the windings must be 0.8 mm.

Circuit diagram:



Q.6. Define FM Receiver circuit using TDA7021 & LM386. Draw its ckt diagram and application.

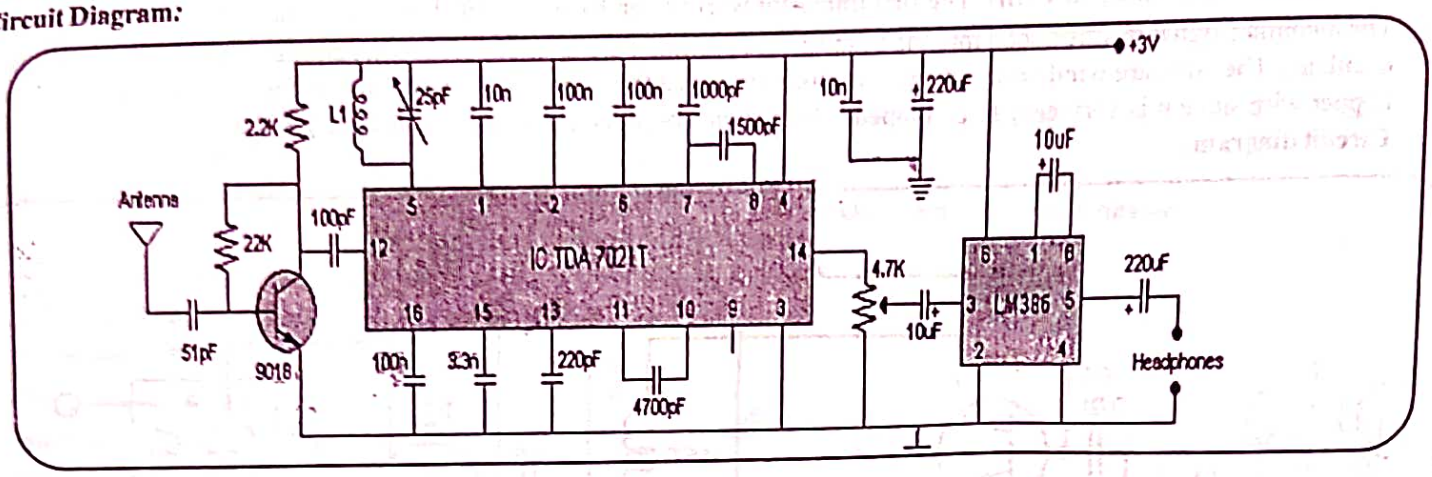
Ans.



Frequency modulation utilizes in a radio station in the 88-108MHz VHF band. This data transfer bandwidth range sets apart as FM on the band sizes of radio receivers. And the devices that can get such signals are called FM receivers.

Here, LM386 and TDA7021 audio amplifier ICs utilizes to receive the sound signals. The 9018 signal amplifier IC additionally deploys to support the IC. The FM radio transmitter is working on a 200kHz wide channel. The most extreme sound frequency transmits in FM is 15 kHz which is 4.5 kHz in AM. This permits a lot bigger scope of frequencies moves in FM and accordingly the quality of FM transmission is essentially higher than of AM transmission.

Circuit Diagram:



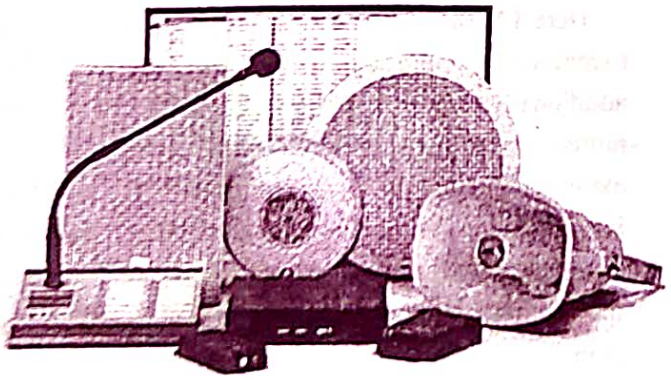
Circuit Operation: Here is a convenient good quality sensitive FM recipient circuit or FM tuner circuit. The circuit is work around the TDA 7021T IC which is an FM radio receiver IC. The IC requires just barely any external parts and the necessary voltage is just 3 volts. The sound yield is low so we have further amplified it with LM386 amplifier IC. You can likewise utilize other high-power sound speakers with it to expand the sound more. A high-frequency tune antenna speaker circuit utilizes at the antenna input segment of the circuit for expanding the affectability. You can change the recurrence with the assistance of a 25pF variable capacitor. The Coil L1 is an air-cored coil equivalent to 5 turns of 1mm silver plated wire turned on 4mm composition.

Applications and Uses:

1. FM receivers are generally used in fin FM radio telecom.
2. It is likewise used in seismic prospecting, telemetry, radar and monitoring newborns for seizures through EEG, music synthesis, two- way radio systems, some video-transmission frameworks and magnetic tape recording systems.

Q.7. Explain PA System.

Ans. A public address system (or PA system) is an electronic system comprising microphones, amplifiers, loudspeakers, and related equipment. It increases the apparent volume (loudness) of a human voice, musical instrument, or other acoustic sound source or recorded sound or music. PA systems are used in any public venue that requires that an announcer, performer, etc. be sufficiently audible at a distance or over a large area. Typical applications include sports stadiums, public transportation vehicles and facilities, and live or recorded music venues and events.



A PA system may include multiple microphones or other sound sources, a mixing console to combine and modify multiple sources, and multiple amplifiers and loudspeakers for louder volume or wider distribution.

Simple PA systems are often used in small venues such as school auditoriums, churches, and small bars. PA systems with many speakers are widely used to make announcements in public, institutional and commercial buildings and locations—such as schools, stadiums, and passenger vessels and aircraft. Intercom systems, installed in many buildings, have both speakers throughout a building, and microphones in many rooms so occupants can respond to announcements. PA and Intercom systems are commonly used as part of an emergency communication system.

OBJECTIVE QUESTIONS ANSWERS

1. What is the full form of PA system in audio devices?

   a) Public address b) Phase action

   c) Power action d) Public action

Answer: a

2. The intensity of sound increases with the distance in PA system.
a) True b) False
Answer: b

3. Which type of system is the PA system in audio devices?
a) Electroacoustic b) Electro dynamic
c) Electromagnetic d) Piezo-electric
Answer: a

4. To which stage is the output of microphone fed in PA system?
a) Voltage amplifier b) Loudspeaker
c) Power amplifier d) Mixer
Answer: d

5. How many types of mixers are there in a PA system in audio devices?
a) 1 b) 2
c) 3 d) 4
Answer: b

6. Which gain control is used in processing circuit in PA system in audio devices?
a) Master b) Slave
c) Key d) Optical
Answer: a

7. Which amplifier uses push-pull type amplifier circuit in PA system?
a) Power amplifier b) Voltage amplifier
c) Driver amplifier
d) Frequency amplifier
Answer: a

8. Which of the following convert electrical signals into pressure variations resulting in sound waves in PA system?
a) Mixer b) Microphone
c) Loudspeaker d) Driver
Answer: c

9. How is the sound power distributed amongst the audience to achieve uniformity in PA system?
a) More loud speakers in listener's area
b) 1 or 2 loudspeaker near a stage
c) 3 or 4 loudspeaker near a stage
d) More loud speakers in listener's area
Answer: a

10. Which type of microphone does not pick up reflected sound as well as the sound waves from the loudspeakers in PA system?
a) Electret b) Moving coil
c) Ribbon d) Cardioid
Answer: d

11. Which effect arises due to the difference in length of sound path lines and hence causes time delay with respect to each other?
a) Stereophonic b) Inductive
c) Mesomeric d) Electromeric
Answer: a

12. Which multiplex system is used for the broadcasting of stereo sound?
a) FM-PM b) AM-AM
c) AM-FM d) FM-FM
Answer: d

13. The IF spectrum consists of a vision carrier, a first IF carrier at 5.5 MHz and a second at 5.7421 MHz from the vision carrier in stereo sound in television.
a) True b) False
Answer: a

14. Which of the following television uses a lens after the picture tube to enlarge the picture?
a) 3D b) Projection
c) HD d) Ultra HD
Answer: b

15. Projection TVs are available in two main configurations called front projection and rear projection.
a) True b) False
Answer: a

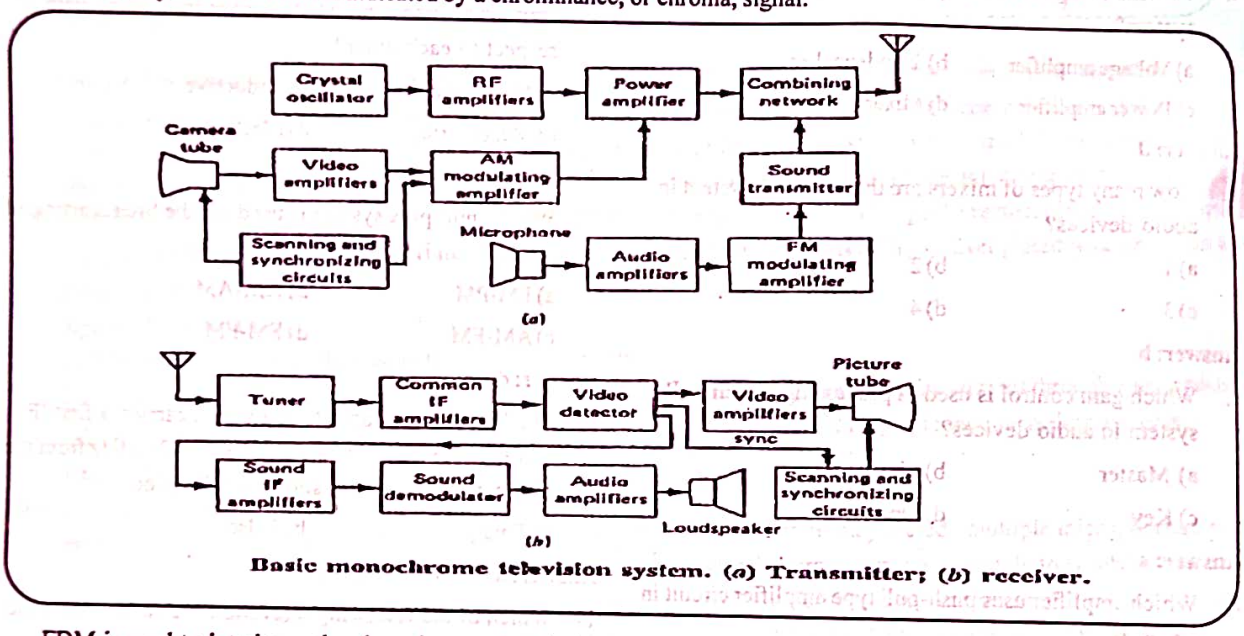
16. What is the full form of LCoS?
a) Liquid Crystal on System
b) Liquid Capacitor on Silicon
c) Liquid Crystal on Silicon
d) Length Crystal on Silicon
Answer: c

UNIT 03

TELEVISION SYSTEM

Q.1. Describe the term Monochrome TV.

Ans. Black-and-white television can be transmitted in this manner, but color TV requires more information. As well as indicating brightness or luminance, as is done in black-and-white TV, color (or actually hue) must also be shown. That is, for each picture element we must show not only how bright it is, but also what hue this element should have, be it white, yellow, red, black or any other. The hue is indicated by a chrominance, or chroma, signal.



Basic monochrome television system. (a) Transmitter; (b) receiver.

FDM is used to interleave the chrominance signal with luminance. The process is quite complex. The chroma signal is assigned portions of the total frequency spectrum which luminance does not use. The situation is complicated by the fact that color and black-and-white TV must be compatible. That is to say, the chroma signals must be coded in such a way that a satisfactory picture will be produced (in black and white) by a monochrome receiver tuned to that channel. Conversely, color TV receivers must be designed so that they are able to reproduce satisfactorily (in black and white) a transmitted monochrome signal.

Q.2. Explain the Scanning Process.

Ans. Most scanners today use the single pass method. The lens splits the image into three smaller versions of the original. Each smaller version passes through a color filter (either red, green or blue) onto a discrete section of the CCD array. The scanner combines the data from the three parts of the CCD array into a single full-color image.

Another imaging array technology that has become popular in inexpensive flatbed scanners is contact image sensor (CIS). CIS replaces the CCD array, mirrors, filters, lamp and lens with rows of red, green and blue light emitting diodes (LEDs). The image sensor mechanism, consisting of 300 to 600 sensors spanning the width of the scan area, is placed very close to the glass plate that the document rests upon. When the image is scanned, the LEDs combine to provide white light. The illuminated image is then captured by the row of sensors. CIS scanners are cheaper, lighter and thinner, but do not provide

the same level of quality and resolution found in most CCD scanners.

Q.3. Define the term Aspect Ratio.

Ans. An aspect ratio is a proportional relationship between an image's width and height. Essentially, it describes an image's shape. Aspect ratios are written as a formula of width to height, like this: 3:2.

For example, a square image has an aspect ratio of 1:1, since the height and width are the same.

Q.4. Explain Persistence of Vision and Flicker in Television Systems:

Ans. The image formed on the retina is always retained on it for a short period. This is because the brightness is sensed by the rods in the retina of the eye by a photochemical process which has its own lag. Hence, the sensation on the eye resulting from single short flash is a function of duration as well as the intensity of the flash, and continue for around 20ms. Actually, the eye acts somewhat like a cumulative storage device. An object of low brightness viewed for a given time produces the same sensation in the eye as an object of greater brightness viewed for a shorter period of time. For intermittent flashes of light incident on the retina, a vigorous photochemical process continues for a fraction of a second (around 20ms) even after the stimulus has disappeared. The continuation of the photochemical process means combination of brightness impression in the visual centre of the brain and is called 'persistence of vision'. This is used in cinema and television in obtaining the illusion of continuity by means of rapidly flashing picture frames.

In television, the field rate is concerned with

(i) Large area flicker

(ii) Smoothness of motion and

(iii) Motion blur in the reproduced picture.

As the field race is increased, the parameters show improvements but tend to saturate beyond 60Hz. Further increase does not pay off, and increases the bandwidth. Hence the picture field scanning is generally done at the rate as the as the mains power supply frequency, which conventionally happens to be 50 or 60Hz for the same reasons of reducing illumination flicker from electric lamps. At 60Hz, the flicker is practically absent, while at 50Hz, a certain amount of borderline flicker may be noticed at high brightness levels used to overcome surrounding ambient light conditions. Use of frequency of the power mains for vertical scanning reduces possible effect like supply ripple and 50Hz magnetic field, in the reproduced picture.

Q.5. Define Interlaced scanning.

Ans. Interlaced scan is a display signal type in which one-half of the horizontal pixel rows are refreshed in one cycle and the other half in the next, meaning that two complete scans are required to display the screen image.

The i in a TV signal specification such as 1080i stands for interlaced scanning. The number indicates the number of horizontal lines in a raster. In an interlaced scan, alternating rows of pixels are refreshed in each cycle. This means that in a 60hz signal, alternating pixels rows are refreshed at 30hz each. Refreshing only half of the pixels per cycle reduces the bandwidth required for the display.

Q. 6. Define Image resolution & its types.

Ans. Image resolution is the detail an image holds. The term applies to digital images, film images, and other types of images. "Higher resolution" means more image detail.

Image resolution can be measured in various ways. Resolution quantifies how close lines can be to each other and still be visibly resolved. Resolution units can be tied to physical sizes (e.g. lines per mm, lines per inch), to the overall size of a picture (lines per picture height, also known simply as lines, TV lines, or TVL), or to angular subtense. Instead of single lines, line pairs are often used, composed of a dark line and an adjacent light line; for example, a resolution of 10 lines per millimeter means 5 dark lines alternating with 5 light lines, or 5 line pairs per millimeter (5 LP/mm). Photographic lens and film resolution are most often quoted in line pairs per millimeter.

Types of Image Resolution:

1.Pixel count

2.Spatial resolution

3.Spectral resolution

4.Temporal resolution

5.Radiometric resolution

Q.7. Explain Composite Video Signal.

Ans. Composite video signal comprises of a camera signal relating to the desired picture data, blanking pulses to make the retrace invisible, and synchronizing pulses to synchronize the transmitter and receiver scanning. A horizontal synchronizing (sync) pulse is required toward the finish of every active line period whereas a vertical sync pulse is required after each field is scanned.

In other words the picture information is not transmitted alone. They carries the various signals along with such as the blanking pulses to make the retrace invisible and synchronizing pulses to synchronize the scanning at the transmitter and at the receiver. All the components all together are known as Composite Video Signal (CVS).

Composite video signal consists of : A camera signal corresponding to the desired picture information, Blanking pulses to make the retrace invisible and Sync pulses to synchronize the Tx & Rx scanning. Composite video signal can be represented either with positive polarity or with negative polarity.

Positive Polarity: In the case of Positive polarity, whiter the scene, higher is the amplitude of the video signal. Blanking level is kept at the zero level. Below zero level is the sync pulse. Sync top is at the most negative point as shown in figure below.

In case when the video signal is produced by photo conduction type camera tubes, bright white light gives a high amplitude of video signal. At the receiver; for reproducing white on the fluorescent screen, a stronger signal is needed and for reproducing black, zero signals are needed,

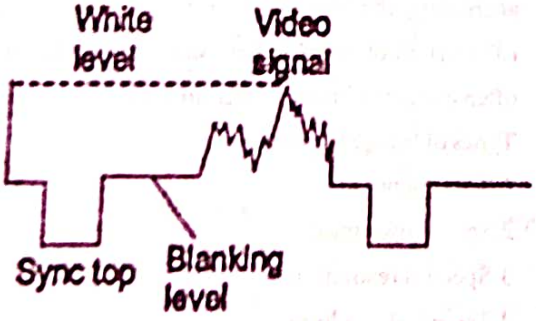


Fig. Positive polarity

Negative Polarity : In case of negative polarity, brighter the scene, smaller is the amplitude. Here sync pulse is positive, that is above the blanking level. Black is just below the blanking level. Brighter the scene, lower is its level below the blanking level. White is near the bottom.

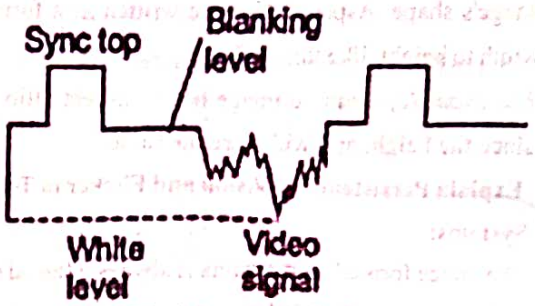
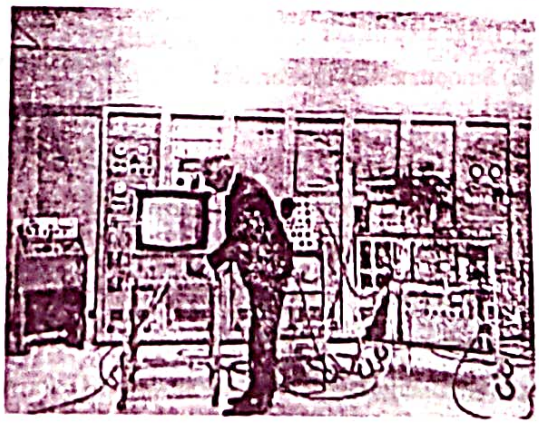


Fig. Negative polarity

The modulation of the RF carrier by the CVS is in the form of negative AM, where bright picture points correspond to low carrier amplitude and the sync pulse to maximum carrier amplitude. This type of modulation is called Negative Modulation.

Q.8. Explain briefly the term Color television.

Ans. Color television is a television transmission technology that includes color information for the picture, so the video image can be displayed in color on the television set. It improves on the monochrome or black-and-white television technology, which displays the image in shades of gray (grayscale). Television broadcasting stations and networks in most parts of the world upgraded from black-and-white to color transmission between the 1960s and the 1980s. The invention of color television standards was an important part of the history and technology of television.



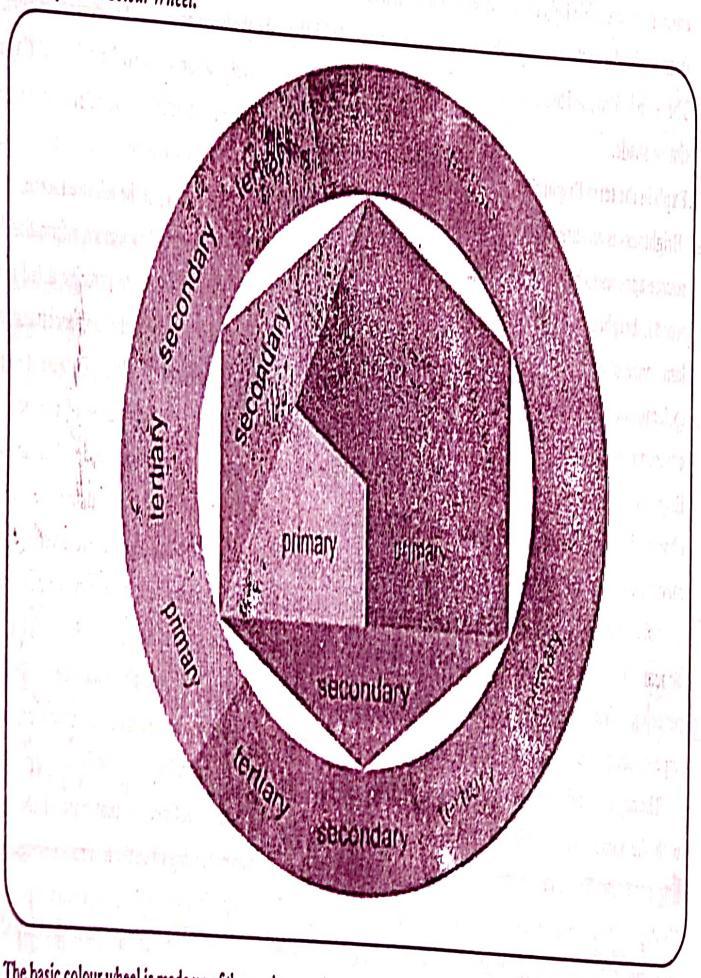
1.

Transmission of color images using mechanical scanners had been conceived as early as the 1880s. A demonstration of mechanically scanned color television was given by John Logie Baird in 1928, but its limitations were apparent even then. Development of electronic scanning and display made a practical system possible. Monochrome transmission standards were developed prior to World War II, but civilian electronics development was frozen during much of the war. In August 1944, Baird gave the world's first demonstration of a practical fully electronic color television display. In the United States, competing color standards were developed, finally resulting in the NTSC color standard that was compatible with the prior monochrome system. Although the NTSC color standard was proclaimed in 1953 and limited programming soon became available, it was not until the early 1970s that color television in North America outsold black-and-white/monochrome units. Color broadcasting in Europe did not standardize on the PAL or SECAM formats until the 1960s.

Q.9. Explain the term colour theory.

Ans. ***Colour Theory:*** It's a potent and persuasive visual cue that has a real influence on consumer decisions, so its selection for a website should not be taken lightly. So what's in a colour ? From strong, powerful red to cool, confident blue, the colour of your website can do as much to evoke emotion in your users as the best written copy in the world. The basics of colour theory should be second nature to us, but just in case, let's take a moment to refresh our memories.

Colour Theory – The Colour Wheel:



The basic colour wheel is made up of three primary colours (red, yellow and blue), three secondary colours (orange, green and violet) and six tertiary colours (red-orange, yellow-orange, yellow-green, blue-green, blue-violet and red-violet). It's from these basic colours that we can make the innumerable variety of tints, shades and tones available to us.

Colour schemes, can be broken down into commonly used categories, and each have differing effects:

1. **Monochromatic:** Monochromatic schemes use variations of the same hue. They're simple, safe and minimal and can be used to achieve a polished, elegant look.

2. **Analogous:** Analogous schemes use colours that sit next to each other on the colour wheel. They're calming and comfortable, are often found in nature, and create a pleasing, unified feel.
3. **Complimentary:** Complimentary schemes use a powerful contrast, colours that are opposites on the colour wheel. They're highly visible and somewhat obnoxious – very much an 'in your face' combination.
4. **Triadic:** The use of triadic colour scheme benefits from the unity of an analogous colour scheme as well as the vibrancy of a complimentary. They're created by using three colours evenly spaced throughout the colour wheel.

Q.10. What Does Hue Mean?

Ans. Hue, in the context of color and graphics, refers to the attribute of a visible light due to which it is differentiated from or similar to the primary colors: red, green and blue. The term is also used to refer to colors that have no added tint or shade.

Q 11. Explain the term Brightness.

Ans. Brightness is an attribute of visual perception in which a source appears to be radiating or reflecting light. In other words, brightness is the perception elicited by the luminance of a visual target. The perception is not linear to luminance, and relies on the context of the viewing environment (for example, see White's illusion).

Brightness is a subjective sensation of an object being observed and one of the color appearance parameters of many color appearance models, typically denoted as {\displaystyle Q}Q. Brightness refers to how much light appears to shine from something. This is a different perception than lightness, which is how light something appears compared to a similarly lit white object.

The adjective bright derives from an Old English beorht with the same meaning via metathesis giving Middle English briht. The word is from a Common Germanic *berhtaz, ultimately from a PIE root with a closely related meaning, *bhereg- "white, bright". "Brightness" was formerly used as a synonym for the photometric term luminance and (incorrectly) for the radiometric term radiance.

Q12. What Does Color Saturation Mean?

Ans. Color saturation refers to the intensity of color in an image. As the saturation increases, the colors appear to be more pure. As the saturation decreases, the colors appear to be more washed-out or pale.

A highly saturated image has vivid, rich and bright colors, while an image with a low saturation will veer towards a scale of grey. In most monitor devices, televisions and graphic editing programs there's an option to increase or decrease saturation.

Color saturation ultimately is one of the three color properties, the other two being hue and value. Saturation is sometimes called "chroma" although the two terms have a slightly different meaning.

While chroma defines the brilliance of a color in absolute terms according to the Munsell Color System, saturation is relative to pure gray. However, in nearly all instances, this difference is quite negligible in practice.

Q.13. Describe the luminance and chrominance colours.

Ans. *Basic principles of compatible colour: The NTSC system:*

The technique of compatible colour television utilizes two transmissions. One of these carries information about the brightness, or luminance, of the televised scene, and the other carries the colour, or chrominance, information. Since the ability of the human eye to perceive detail is most acute when viewing white light, the luminance transmission carries the impression of fine detail. Because it employs methods essentially identical to those of a monochrome television system, it can be picked up by black-and-white receivers. The chrominance transmission has no appreciable effect on black-and-white receivers, yet, when used with the luminance transmission in a colour receiver, it produces an image in full colour.

To create the luminance-chrominance values, it is necessary first to analyze each colour in the scene into its component primary colours.

Chrominance : Defined as that part of the colour specification remaining when the luminance is removed, is a combination of the two independent quantities, hue and saturation. Chrominance may be represented graphically in polar coordinates on a colour circle (as shown in the diagram), with saturation as the radius and hue as the angle. Hues are arranged counterclockwise around the circle as they appear in the spectrum, from red to blue. The centre of the circle represents white light (the colour of zero saturation), and the outermost rim represents the most

saturation. Points on any radius of the circle represent all colours of the same hue, the saturation becoming less (that is, the colour becoming less vivid, or more pastel) as the point approaches the central "white point." A diagram of this type is the basis of the international standard system of colour specification.

In the NTSC system, the chrominance signal is an alternating current of precisely specified frequency (3.579545 ± 0.000010 megahertz), the precision permitting its accurate recovery at the receiver even in the presence of severe noise or interference.The chrominance signal is thereby simultaneously modulated in both amplitude and phase.

Q14. Explain the Different types of TV camera.

Ans. *Types of Television Cameras:*

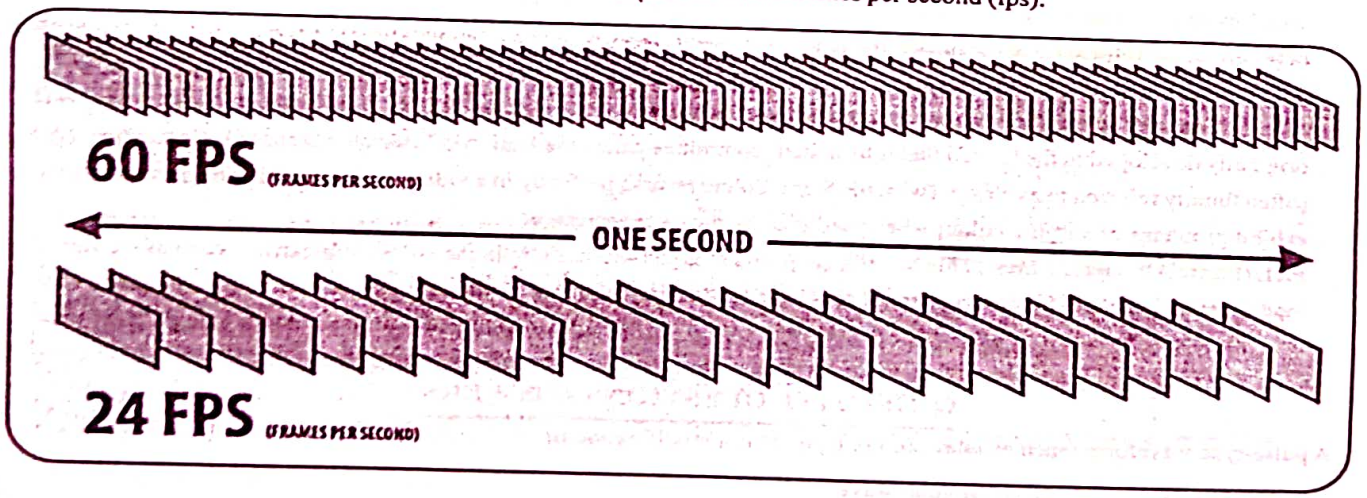
1. **Studio Camera:**A television camera placed on a tripod or studio pedestal for exclusive use within the studio. studio cameras are light and small enough to be taken off the pedestal and the lens changed to a smaller size to be used on a multiple-camera setup's shoulder, but they still have no recorder of their own and are cable-bound.These cameras have a tally light, a small signal-lamp used that indicates, (for the benefit of those being filmed as well as the camera operator) that the camera is 'live'.
2. **Remote Camera:**Television Cameras are called video cameras now. Studio, EFP and remote cameras. They are classified according to their versatility and their purposes.

A camera placed by a photographer in areas where the photographer generally cannot be. This includes areas with limited access, tight spaces where a person is not allowed, or just another angle so that the photographer can simultaneously take pictures of the same moment from different locations.Remote cameras are most widely used in sports photography. remote cameras are typically very small camera heads designed to be operated by remote control. Despite their small size, they are often capable of performance close to that of the larger ENG and EFP types.

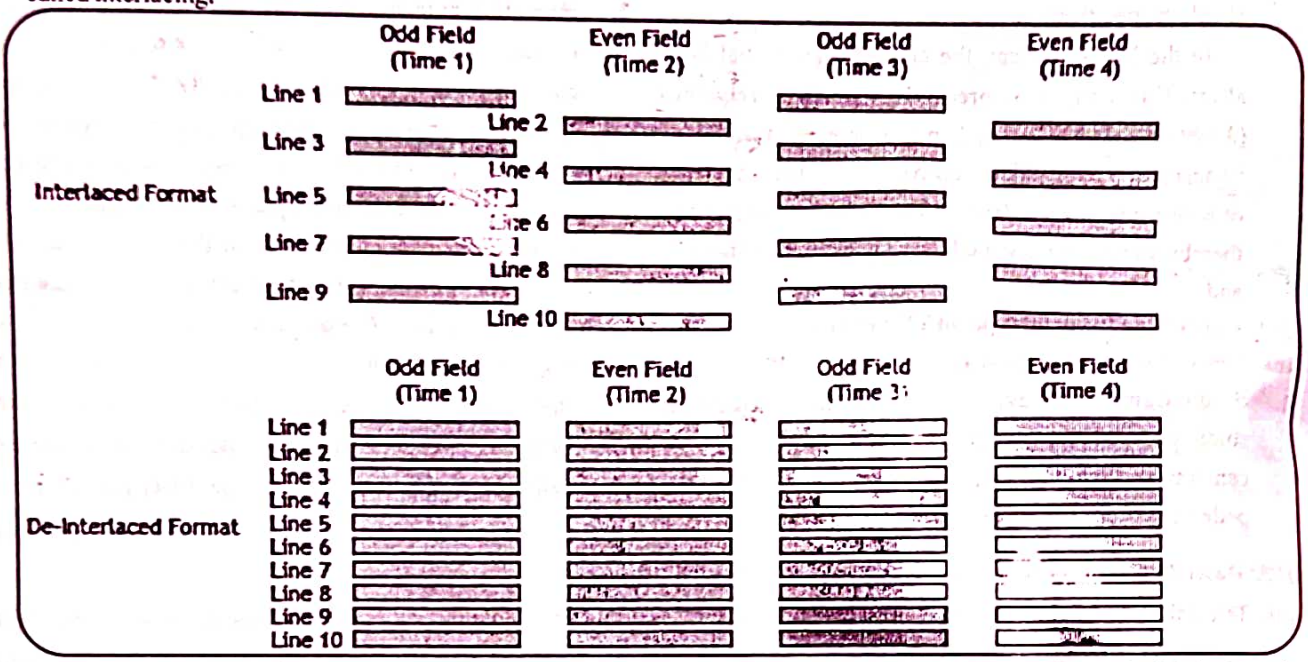
Q15. Describe Transmission standards.

Ans. Television Standards :There are a number of TV Standards worldwide. Not all television sets in the world are alike. Countries use one of the three main video standards – PAL, NTSC or SECAM. What this means is that a video from a PAL country will not play in a country that uses the NTSC standard.

Frames: Before we dive deep into the various TV Standards we shall take a look at a few basics of TV transmission. A television transmission consists of a set of rapidly changing pictures to provide an illusion of continuous moving picture to the viewer. The pictures need to come at a rate of 20 pictures per second to create this illusion. Each of these "rapidly changing" pictures is a frame. A typical TV transmission is at 25-30 frames per second (fps).



Lines: Each frame consists of several closely spaced lines. The lines are scanned from left to right and from top to left. A typical TV picture consists of 525 to 625 lines. Considering this large number of lines, if all were to be written one after another the picture would begin to fade at the top by the time the last line is written. To avoid this, the first frame carries the odd numbered lines and the next frame carries the even numbered lines. This provides uniformity in the picture and this is called interlacing.



Timing: TV receivers require a source to time the rapid succession of frames on the screen. Designers decided to use the Mains power supply frequency as this source for two good reasons. The first was that with the older type of power supply, you would get rolling hum bars on the TV picture if the mains supply and power source were not at exactly the same frequency. The second was that the TV studio lights or for that matter all fluorescent, non incandescent lights flicker at the mains frequency. Since this flicker is much higher than 16 times per second the eye does not detect it. However this flicker could evolve into an extremely pronounced low frequency flicker on TV screens due to a "beat" frequency generated between the light flicker and the mains frequency. This would have made programmes un-viewable particularly in the early days of development of TV receivers.

NTSC (National Television Standards Committee): The majority of 60Hz based countries use a technique known as NTSC originally developed in the United States by a focus committee called the National Television Standards Committee. NTSC (often funnily referred to as Never Twice the Same Colour) works perfectly in a video or closed circuit environment but can exhibit problems of varying colour when used in a broadcast environment.

PAL (Phase Alternate Lines): This hue change problem is caused by shifts in the colour sub-carrier phase of the signal. A modified version of NTSC soon appeared which differed mainly in that the sub-carrier phase was reversed on each second line; this is known as PAL, standing for Phase Alternate Lines (it has a wide range of funny acronyms including Pictures At Last, Pay for Added Luxury etc). PAL has been adopted by a few 60Hz countries, most notably Brazil.

OBJECTIVE QUESTIONS ANSWERS

1. A pulse-type waveform (such as television line pulse) is a modification of

A. square wave B. rectangular wave

C. sawtooth wave D. sine wave

Answer: B

2. The main purpose of interlacing in television scanning is to

A. reduce flicker

B. brighten the TV picture

C. sharpenpicture outline

D. increase channel bandwidth

Answer: A

3. If a TV picture has 525 lines and scanning rate is 30 pictures/second, time for scanning one line is second.

A. 30/525 B. 525/30

C. 1/30x525 D. 30x525

Answer: C

4. If there are 625 lines per TV picture, then lines per field are

A.1250 B.312.5

C.625 D.2500

Answer: B

5. The function of a sync separator ina TV set is to separate the signals.

A. video and sound

B. video and line sync

C. line sync and field sync

D. sound and field sync

Answer: C

6. The main function of electron gun in a cathode-ray tube is to —— electrons.

A. deflect B. produce

C. size D. aspect

Answer: B

7. In a CRT, focussing of electron beam is achieved by varying

A. grid bias B. heater voltage

C. voltage of first accelerating anode

D. secondary accelerating voltage

Answer: D

8. In India, which monochrome TV system is used

A. 525 line system B. 625 line system

C. 819 line system D. None of these

Answer: B

9. The color TV system used in India is

A. NTSC B. PAL-B

C. SECAM D. None of these

Answer: B

10. Aspect ratio for width to height for a TV picture frame is

A. 1:1 B.2:3

C.4:3 D.16:9

Answer: C

11. The number of interruption in projection movie pictures on a cinema screen are

A. 50 B.60

C.24 D.48

Answer: D

12. Field frequency in India is

A. 60 Hz B. 50 Hz

C. 15625 Hz D. 625 Hz

Answer: B

13. Horizontal scanning frequency, according to CCIR standards is

A. 15750 Hz B. 15625 Hz

C. 60 Hz D. 15725 Hz

Answer: B

14. Trace period of a horizontal line is

A. 64 µs B. 12 µs

C. 52 µs D. 1280 µs

Answer: C

15. The horizontal resolutions of a picture depends on

A. The number of horizontal lines

B. Horizontal scanning rate

C. The vertical scanning rate

D. Both 1st and 2nd

Answer: D

16. Retrace period of a horizontal line is

A. 64 μs B. 12 μs

C. 52 μs D. 20 μs

Answer: B

17. Trace period of a vertical sweep is

A. 18720 μs B. 1280 μs

C. 20 ms D. None of the above

Answer: A

18. Each sequence of scanning in the interlaced scanning method is known as

A. Field B. Scanning lines

C. Trace path D. Retrace path

Answer: A

19. Vertical blanking period is

A. Equal to the vertical retrace

B. Greater than the vertical retrace

C. Less than the vertical retrace

D. None of these

Answer: B

20. According to CCIR standards the field sync occurs after lines

A. 312.5 and 625 B. 262.5 and 625

C. 310 and 662.5 D. None the above

Answer: A

21. Aspect ratio of a televisions is

A. 3:4 B. 4:3

C. 3:1 D. None of these

Answer: B

22. In India, horizontal blanking pulse is

A. 12 μs B. 4.7 μs

C. 1280 μs D. 1870 μs

Answer: A

23. The width of H-sync pulse in India is

A. 12 μs B. 4.7 μs

C. 1870 μs D. 52 μs

Answer: B

24. In interlaced scanning, there is one half line spacing between the start positions for scanning odd and even fields. This is done to produce

A. Horizontal Scanning

B. Linear Scanning

C. Exact Interlacing

D. Line Pairing

Answer: C

25. According to CCIR standards, the televisions screen is blanked out

A. 25 times in one second

B. 60 times in one second

C. 50 times in one second

D. 15625 times in one second

Answer: C

26. The value of Kell factor is about .....

A. 0.5 B. 0.3

C. 0.7 D. 0.9

Answer: C

27. Bandwidth of AMVSB for video carrier is

A. 4 MHz B. 5.75 MHz

C. 7.85 MHz D. 11 MHz

Answer: B

28. The term pedestal is used for

A. Sync top level B. Blanking Pulse

C. Black level D. White level

Answer: B

29. Video signals below 10% of the carrier are known as:

A. Pedestal height B. Blacker than black

C. Whiter than white

D. None of the above

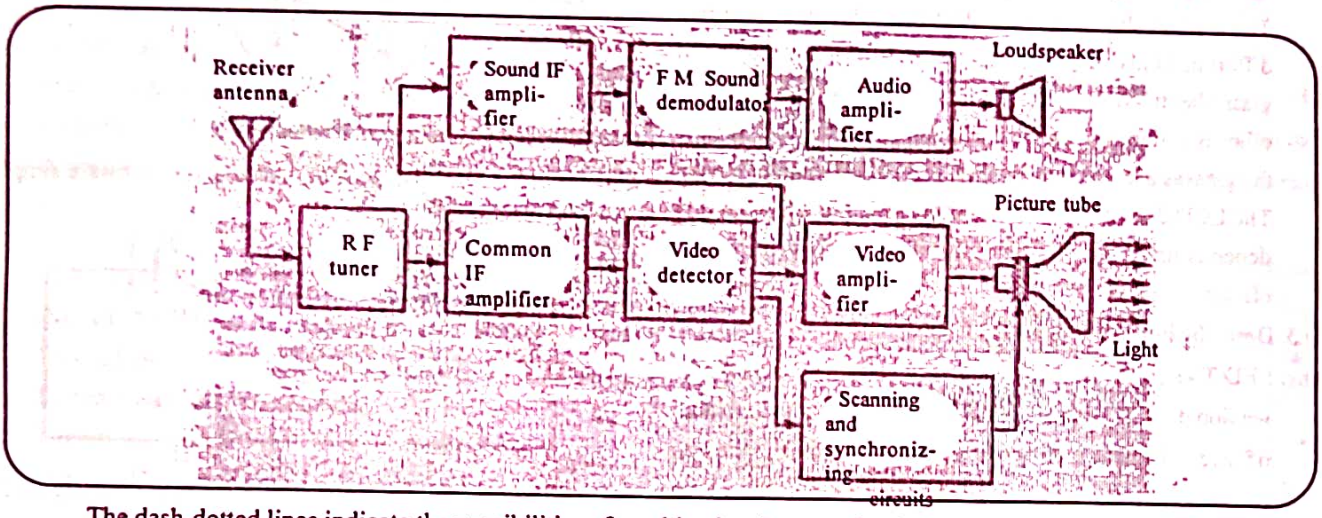
Answer: C

UNIT 04

Television Receivers and Video Systems

Q.1. Explain PAL-D colour TV receiver.
Ans.

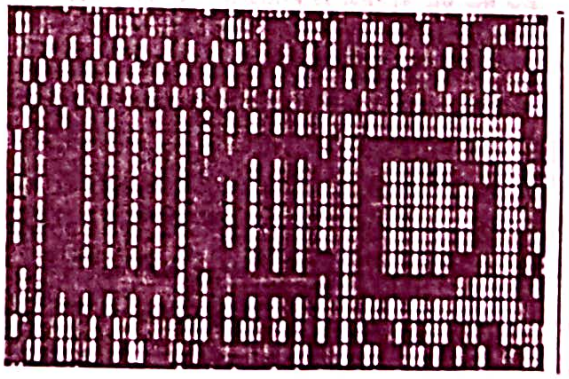
of standardization in circuit design, there is still a broad line of integrated circuits being offered for colour TV receivers due to the variety of possible combinations of the functional units. For better explanation of the interworking of the functionalunits included in a PAL colour TV receiver, the individual units are shown separately in Fig.



The dash-dotted lines indicate the possibilities of combination that are feasible and have been realized in practice by way of including several functional units in integrated circuits. The RF signal coming from the antenna is converted into the IF in the VHF-UHF tuner; next it is taken via the Nyquist filter to compensate for the vestigial sideband component and then boosted in the IF amplifier to the level required for demodulation. To ensure that there is no intermodulation between the colour subcarrier and the intercarrier sound carrier, the IF sound carrier is isolated from the vision IF demodulator. In a separate diode circuit, the 5.5 MHz intercarrier sound IF signal is produced from the sound IF and the vision IF.

Q.2. Briefly explain the term LCD. ?

Ans. Liquid crystal is used as display device in LCD television. A series of cold cathode fluorescent (CCFL) is used at the back of the screen for providing light in LCD television. CCFL is made up of long sealed glass tube having small diameter, inner phosphor coating and are filled with inert gas. A high voltage is applied across the tube. This causes the ionization of gases, which creates ultraviolet (UV) light that excites an inner coating of phosphor to produce visible light. CCFL is an excellent white light source, low cost and have long life.



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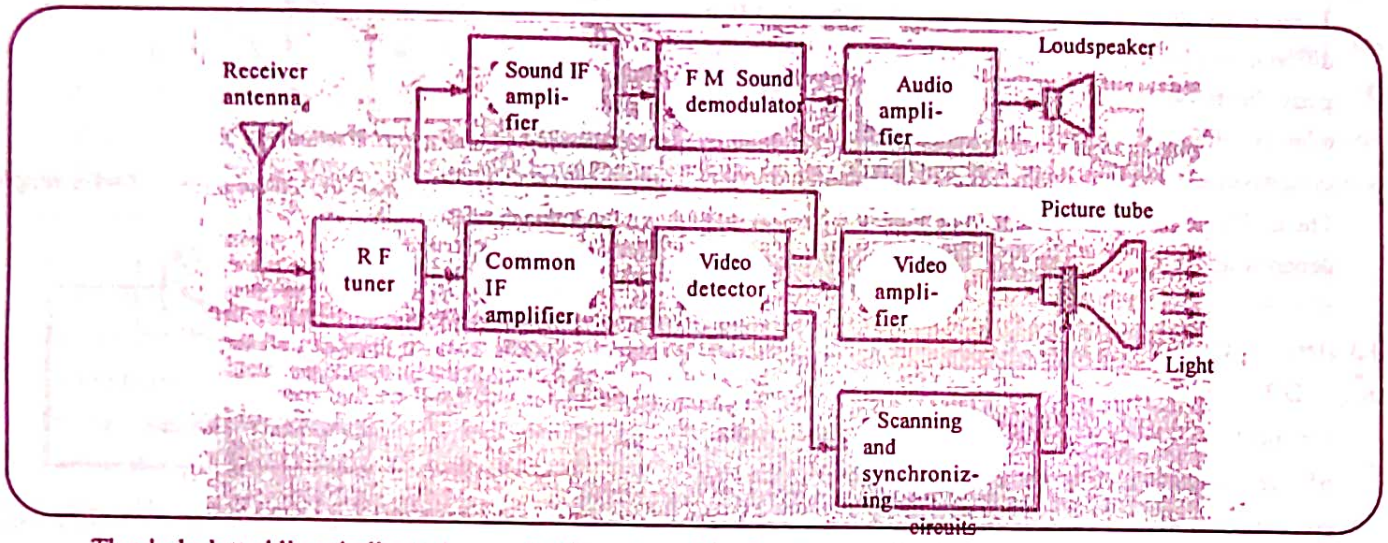
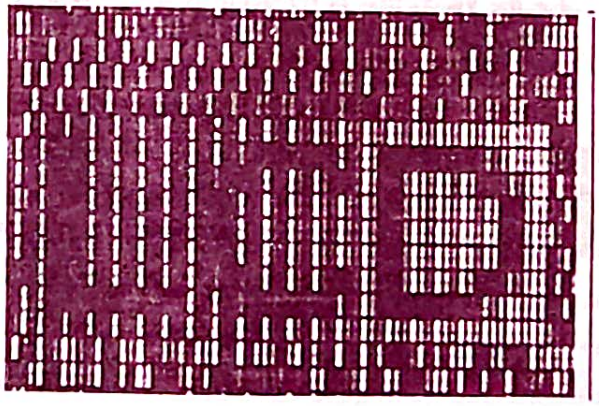


The dash-dotted lines indicate the possibilities of combination that are feasible and have been realized in practice by way of including several functional units in integrated circuits. The RF signal coming from the antenna is converted into the IF in the VHF-UHF tuner; next it is taken via the Nyquist filter to compensate for the vestigial sideband component and then boosted in the IF amplifier to the level required for demodulation. To ensure that there is no intermodulation between the colour subcarrier and the intercarrier sound carrier, the IF sound carrier is isolated from the vision IF demodulator. In a separate diode circuit, the 5.5 MHz intercarrier sound IF signal is produced from the sound IF and the vision IF.

Q.2. Briefly explain the term LCD. ?

Ans. Liquid crystal is used as display device in LCD television. A series of cold cathode fluorescent (CCFL) is used at the back of the screen for providing light in LCD television. CCFL is made up of long sealed glass tube having small diameter, inner phosphor coating and are filled with inert gas. A high voltage is applied across the tube. This causes the ionization of gases, which creates ultraviolet (UV) light that excites an inner coating of phosphor to produce visible light. CCFL is an excellent white light source, low cost and have long life.



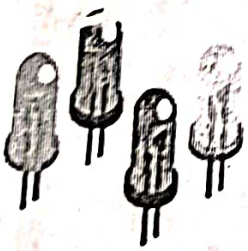
Liquid crystal display (LCD) is used now these days everywhere as display device. LCD is clearly replacing the CRT (cathode ray tube), because the size of CRT is bigger and it also draws large amount of power in comparison to LCD. LCD is made up of the liquid crystal.

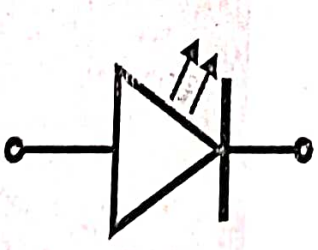
Liquid crystal is the combination of two states of matter-solid and liquid. It possess both the properties of solids and liquids and maintain their respective states with respect to another. The liquid crystal material shows more of a liquid state than that of a solid state. Liquid crystals are more heat sensitive than liquids. A little heat can transform liquid crystal into liquid.

A liquid crystal cell is placed between two glass sheets. These glass sheets contain electrodes. We can form two different kinds of LCDs on the basis of the selection of glass sheets. When one of the glasses is transparent and other is reflective then it is called reflective type. If both the glasses are transparent then it is called transitive type. The LCD does not produce luminance of itself. It entirely depends upon the illumination falling on it for its visual effects.

Q.3. Describe in briefly the term LED.

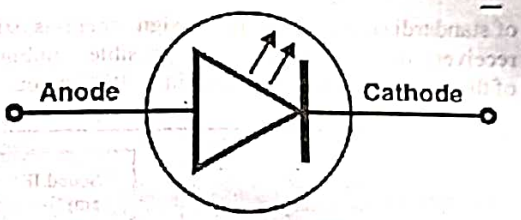
Ans. LED TVs (light-emitting diode televisions) are advanced version of LCD (liquid crystal display) televisions because of their high quality of picture and least power consumption. So far as technologies are concerned both (LED and LCD) are having similar kind of architecture. The only difference is that LED televisions contain light emitting diodes (LED) behind their screen. These LEDs provides sharper graphics and more illuminating effect upon the provision of current. CCFL (Cold cathode fluorescent lamp) used in LCD for the display which contains inert gas inside tube is producing desired light for the visual that is replaced by the LED in the LED television.





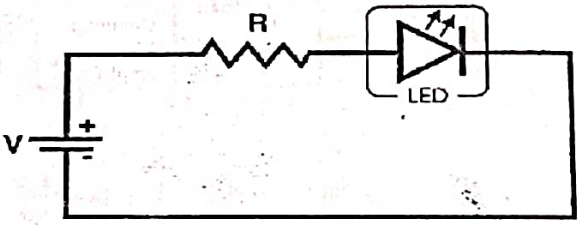
Light-emitting diodes are heavily doped p-n junctions. Based on the semiconductor material used and the amount of doping, an LED will emit a coloured light at a particular spectral wavelength when forward biased. As shown in the figure, an LED is encapsulated with a transparent cover so that emitted light can come out.

LED Symbol: The LED symbol is the standard symbol for a diode, with the addition of two small arrows denoting the emission of light.



LED Symbol

Simple LED Circuit: The figure below shows a simple LED circuit.



LED Circuit

The circuit consists of an LED, a voltage supply and a resistor to regulate the current and voltage.

Advantages

1. Fine display of image.
2. Having better resolution and contrast.
3. Low power consumption.
4. Environmental friendly.
5. It is free from the defects of angle viewing which occurs in LCD.

Q.4. Explain Plasma TV briefly.

Ans. Plasma TV is a television display technology in which each pixel on the screen is illuminated by a tiny bit of plasma (charged gas). The plasma is encased between two thin sheets of glass.

Plasma displays are generally considered to offer better dark-room viewing and wider viewing angles than LCD.

Plasma TVs are available in sizes from 37 inches to over 100 inches, measured diagonally. Plasma can be vulnerable to burn-in, a phenomenon in which faint, permanent "ghosts" appear on displays that have maintained a fixed image for long periods of time. Examples of such images include the bars seen when watching 4:3 video on a widescreen display or the constantly running ticker seen on some shows or channels. Most newer models have burn-in prevention features, but these may not always be 100% effective. However, some plasma TVs also have the ability to remove burn-in should it occur. Vendors of plasma TVs include Fujitsu, Funai, Gradiente, Lanix, LG, Panasonic, Proscan, Samsung and Sanyo.

Q.5. Explain the term HDTV.

Or. Define HDTV and write the comparison with television system ?

Or. Define HDTV and write its two feature ?

Or. Define HDTV and explain its HDTV Receiver?

Ans. HDTV stands for high definition TV. It is assumed to be advanced digital broadcast system, which is having high degree of resolution compared to the other TV system so far available. It requires comparatively less bandwidth. It has two key features.

1. Increase in picture resolution 16:9 widescreen.
2. Support multichannel audio.

The standard NTSC and PAL system of broadcast have 525 and 625 horizontal lines. In this system, the real lines used to represent picture are said to be active lines. Both the systems have the feature of interlacing that means each frame is broken into two fields of odd and even lines which are displayed alternatively. The viewer puts them together to create complete image of each frame.

HDTV Format : It has two formats of broadcast, 720p and 1080i. The numeric number shows the resolution of vertical line in each format. The alphabet 'p' and 'i' stands for progressive and interlaced scan that means they are unisum, not been split into fields. In 720p, the image made of horizontal 1280 lines and 720 vertical lines. Therefore, the full image is represented in a single frame. In 1080i the images are made of 1980x1080 lines and represent as two fields both are interlaced.

The quality of these interlaced images is not very smooth in contrast to the progressive one as per the studies carried out. The video bandwidth required five to six times more than that of conventional TV system. E.g. video bandwidth is 5 MHz for 625 lines system and hence relative HDTV bandwidth required will be 30 MHz. Such a large bandwidth decreases number of channels to be transmitted. To overcome this problem band compression technique is used to decrease the bandwidth.

The important consideration of HDTV in comparison with television systems are as follows:

1. HDTV is having more scanning lines than conventional TV system.
2. HDTV aspect ratio is more than conventional TV system.
3. HDTV requires more bandwidth than conventional TV system.
4. HDTV propose progressive scanning while conventional TV system uses interlaced scanning.

HDTV Receiver : To receive image of broadcast, we need TV set with built-in HDTV receiver, which is capable of receiving HDTV channels. HDTV receiver receives composite video signal. Then it decodes and demodulates

to get the transmitted audio and video signals. the composite signal is demultiplexed into audio and video bit streams and then decompressed. Then thereafter these bit streams are converted into analog form by the application of D/A converter. The analog audio signal drives audio section and the video signal drives video section of the HDTV receiver. In this way HDTV receiver reproduce audio and video information. They are having wide range of applications such as production of motion picture, video theatre, printing and health diagnosis.

Q.6. Describe 3-D tv and its sets.

Ans.

3D television (3DTV) is television that conveys depth perception to the viewer by employing techniques such as stereoscopic display, multi-view display, 2D-plus-depth, or any other form of 3D display. Most modern 3D television sets use an active shutter 3D system or a polarized 3D system, and some are autostereoscopic without the need of glasses.

TV sets: These TV sets were high-end and generally included Ethernet, USB player and recorder, Bluetooth and USB Wi-Fi.

1. *3D-ready TV sets:* 3D-ready TV sets are those that can operate in 3D mode (in addition to regular 2D mode) using one of several display technologies to recreate a stereoscopic image. These TV sets usually supported HDMI 1.4 and a minimum output refresh rate of 120 Hz; glasses may be sold separately. Philips was developing a 3D television set that would be available for the consumer market by about 2011 without the need for special glasses (autostereoscopy). However it was canceled because of the slow adoption of customers going from 2D to 3D.
2. *Full 3D TV sets:* Full 3D TV sets included Samsung Full HD 3D (1920×1080p, 60 Hz) and Panasonic Full HD 3D (1920×1080p, 60 Hz). A September 2011 Cnet review touted Toshiba's 55ZL2 as "the future of television". Because of the demanding nature of auto-stereoscopic 3D technology, the display features a 3840x2160 display; however, there was at the time no video content available at this resolution. That said, it utilizes a multi-core processor to provide excellent upscaling to the "4k2k" resolution. Using a directional lenticular lenslet filter, the display generates nine 3D views. This technology commonly creates deadspots, which Toshiba avoids by using an eye-tracking camera to adjust the image. The reviewers also note that the 3D resolution for a 1080p signal looks more like 720p and lacks parallax, which reduces immersion.

Q7. Describe in briefly Rear-projection television (RPTV), and its types.

Ans. Rear-projection television (RPTV) is a type of large-screen television display technology. Until approximately 2006, most of the relatively affordable consumer large screen TVs up to 100 in (250 cm) used rear-projection technology. A variation is a video projector, using similar technology, which projects onto a screen.

Three types of projection systems are used in projection TVs. CRT rear-projection TVs were the earliest, and while they were the first to exceed 40", they were also bulky and the picture was unclear at close range. Newer technologies include: DLP (reflective micromirror chip), LCD projectors, Laser TV and LCoS.

They are capable of 1080p resolution, and examples include Sony's SXRD (Silicon X-tal Reflective Display), JVC's D-ILA (Digital Direct Drive Image Light Amplifier) and MicroDisplay Corporation's Liquid Fidelity.

The following are different types of projection televisions, which differ based on the type of projector and how the image (before projection) is created:

1. **CRT projector:** Small cathode ray tubes create the image

in the same manner that a traditional CRT television does, which is by firing a beam of electrons onto a phosphor-coated screen and then the image is projected to a large screen. This is done to overcome the limit of size of cathode ray tube which is about 40 inches. Normally 3 CRTs are used, one red, one green and one blue, aligned so the colors mix correctly on the projected image.

2. **LCD projector:** A lamp transmits light through a small LCD chip made up of individual pixels to create an image. The LCD projector uses mirrors to take the light and create three separate red, green, and blue beams, which are then passed through three separate LCD panels. The liquid crystals are manipulated using electric current to control the amount of light passing through. The lens system takes the three color beams and projects the image.
3. **Digital Light Processing (DLP) projector:** A DLP projector creates an image using a digital micromirror device (DMD chip), which on its surface contains a large matrix of microscopic mirrors, each corresponding to one pixel in an image. Each mirror can be rotated to reflect light such that the pixel appears bright, or the mirror can be rotated to direct light elsewhere and make the pixel appear dark. The mirror is made of aluminum and is rotated on an axle hinge. There are electrodes on both sides of the hinge controlling the rotation of the mirror using electrostatic attraction

Q.8. Explain DTH Technology system . Draw the suitable block diagram for the DTH and write its Advantages.

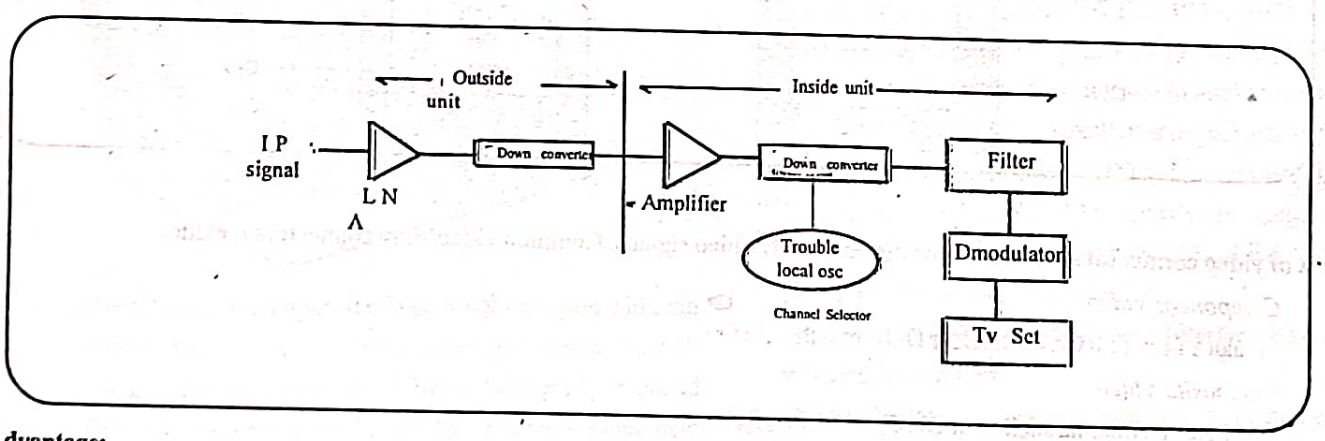
Ans. Direct to home Broadcast (DTH):DTH stands for Direct-To-Home television. DTH is defined as the reception of satellite programmes with a personal dish in an individual home.

* DTH Broadcasting to home TV receivers take place in the ku band(12 GHz). This service is known as Direct To Home service.
* DTH services were first proposed in India in 1996.
* Finally in 2000, DTH was allowed.
* The new policy requires all operators to set up earth stations in India within 12 months of getting a license. DTH licenses in India will cost $2.14 million and will be valid for 10 years.
* Working principal of DTH is the satellite communication. Broadcaster modulates the received signal and transmit it to the satellite in KU Band and from satellite one can receive signal by dish and set top box.

1. DTH Block Diagram:

* A DTH network consists of a broadcasting centre, satellites, encoders, multiplexers, modulators and DTH receivers
* The encoder converts the audio, video and data signals into the digital format and the multiplexer mixes these signals.

It is used to provide the DTH service in high populated area A Multi Switch is basically a box that contains signal splitters and A/B switches. A outputs of group of DTH LNBs are connected to the A and B inputs of the Multi Switch.



Advantage:

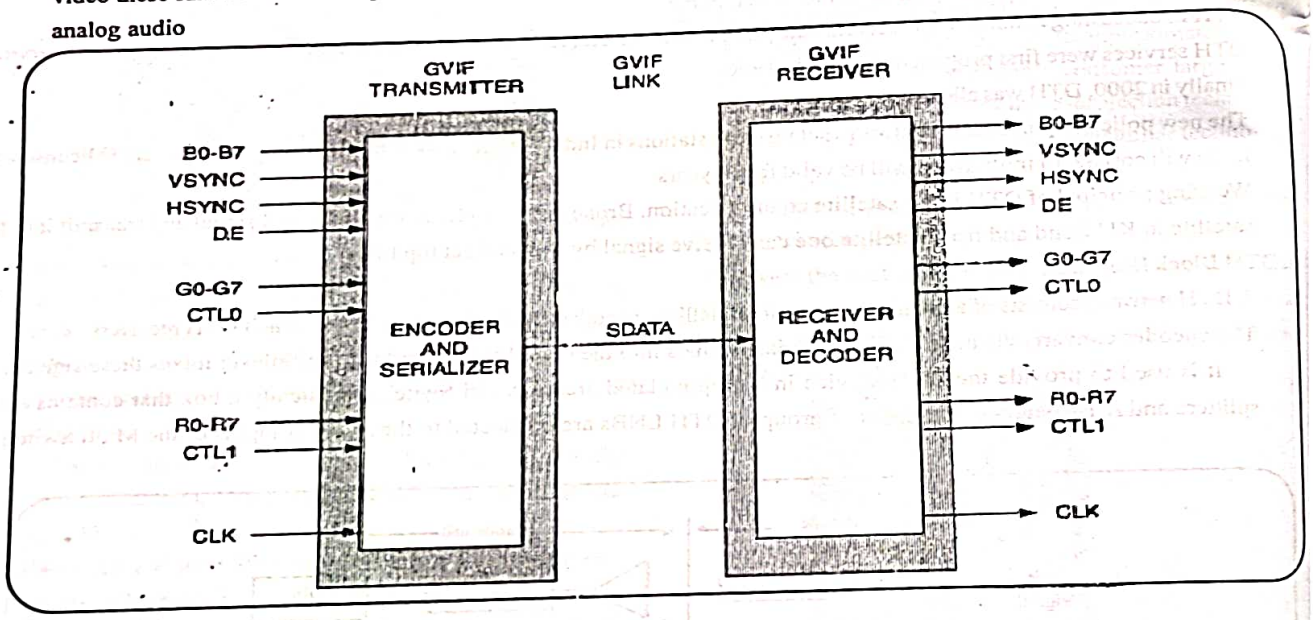
1. DTH also offers digital quality signals which do not degrade the picture or sound quality.
2. It also offers interactive channels and program guides with customers having the choice to block out programming which they consider undesirable

3. One of the great advantages of the cable industry has been the ability to provide local channels, but this handicap has been overcome by many DTH providers using other local channels or local feeds.
4. The other advantage of DTH is the availability of satellite broadcast in rural and semi-urban areas where cable is difficult to install.

Q.9. Explain the term Video Interface. And write the name of some Video connectors.

Ans. Video Interface means any portion of an integrated circuit, product or application, the function of which is to receive, transmit and/or sample (using a clock signal) raw or compressed digital or analog data streams containing/representing video and or still images. Video Interface shall not include any circuitry or functionality to process the content of the data stream, other than processing of the type that is required to comply with industry video interface standards existing as of the Effective Date (and evolutions of such standards) for video receivers and transmitters. Video Interface circuitry may also include a reverse function of transmitting a data stream containing video and or still images.

Video interfaces define physical parameters and interpretation of signals. For digital audio and digital video, this can be thought of as defining the physical layer, data link layer, and most or all of the application layer. For analog audio and analog video these functions are all represented in a single signal specification like NTSC or the direct speaker-driving signal of analog audio



List of video connectors: Video connectors carry only video signals. Common video-only connectors include:

Component video

aka YPbPr (3 RCA or BNC; or D-Terminal)

Composite video

(1 RCA, Antenna socket, or BNC)

DB13W3 ("13W3" computer video connector)

DMS-59, single connector carrying two DVI and two VGA

Musa, British connector used in broadcasting and telecommunications

PAL connector, common in Europe as an antenna connector

S-Video (1 Mini-DIN)

SDI - Broadcast grade digital interface over BNC cables

VGA connector A type of D-sub connector standard on most video cards

Mini-VGA Found on some laptop computers

5 BNC Connectors can also be used to carry the VGA signal as R, G, B, HSync, VSync

Digital Visual Interface (DVI) A hybrid analog/digital connector commonly found on PC graphics cards and LCD monitors

Mini-DVI Found on some Apple laptops

Enhanced Graphics Adapter (EGA)

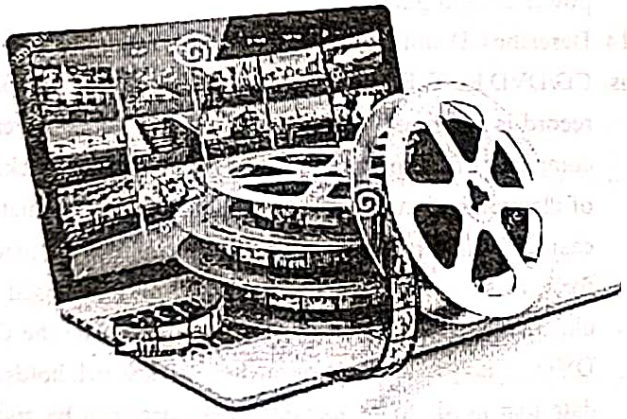
RGB interface

RGBI interface

VESA Digital Flat Panel

Q10. What Does Digital Video (DV) Mean?

Ans. Digital video (DV) is video that is captured and stored in a digital format as ones and zeros, rather than a series of still pictures captured in film. Digital, versus analog, signals are used. Information is processed and stored as a sequence of digital data for easy manipulation by computers, but the video is still presented to the viewer through a screen in analog form.

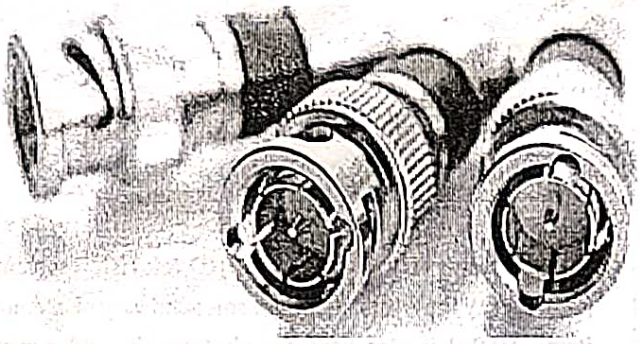


Digital video is composed of a series of orthogonal bitmap (BMP) images displayed in constant rapid succession with common frequencies of 15, 24, 30 and 60 frames per second (FPS); the more frames the DV has, the more movement details are captured or displayed.

As a point of reference, good quality movies and videos are recorded and viewed at 60 FPS, while super slow motion videos are taken with high-speed photography equipment at more than 1,000 FPS and then viewed at standard rates. Each orthogonal BMP image or frame in the DV includes a raster of pixels with width and height expressed in number of pixels, known as resolution. The higher the captured video's resolution, the higher its clarity and quality.

Q.11. Explain the term SDI.

Ans. Serial digital interface (SDI) is a family of digital video interfaces first standardized by SMPTE (The Society of Motion Picture and Television Engineers) in 1989. For example, ITU-R BT.656 and SMPTE 259M define digital video interfaces used for broadcast-grade video.



A related standard, known as high-definition serial digital interface (HD-SDI), is standardized in SMPTE 292M; this provides a nominal data rate of 1.485 Gbit/s.

Additional SDI standards have been introduced to support increasing video resolutions (HD, UHD and beyond), frame rates, stereoscopic (3D) video,and color depth.Dual link HD-SDI consists of a pair of SMPTE 292M links, standardized by SMPTE 372M in 1998;this provides a nominal 2.970 Gbit/s interface used in applications (such as digital cinema or HDTV 1080P) that require greater fidelity and resolution than standard HDTV can provide. 3G-SDI (standardized in SMPTE 424M) consists of a single 2.970 Gbit/s serial link that allows replacing dual link HD-SDI. 6G-SDI and 12G-SDI standards.

Q12. Explain High-Definition Multimedia Interface (HDMI) and write its advantages.

Ans. The HDMI is a connection method that combines both uncompressed audio and video into a single digital interface and is used for connecting various types of products. It supports both high-definition and standard-

definition video and up to 8-channel digital audio. When HDMI was first introduced it offered a level of performance that was much greater than that available previously and since then it has developed to accommodate the latest audio and visual standards.

The HDMI interface is used on many audio visual applications from televisions to computer monitors and home entertainment systems to video displays and much more. The HDMI interface has a far higher specification than previous interconnection systems that were used.

As a result HDMI is used for HD television systems, Blu-Ray DVD players, game consoles and very many more items. HDMI is also used for photography and a mini-HDMI connector is incorporated into many camcorders, DSLRs and many other forms of camera. There is even a micro-HDMI connector intended for mobile devices like phones, etc.

Advantages of HDMI:

It supports high-quality, uncompressed, digital video and audio without the quality loss associated with analog connections.

Instead of using multiple cables, a single cable can be used for video and audio.

It can provide two-way communication between digital products, allowing the potential for additional functionality - such as BRAVIA sync.

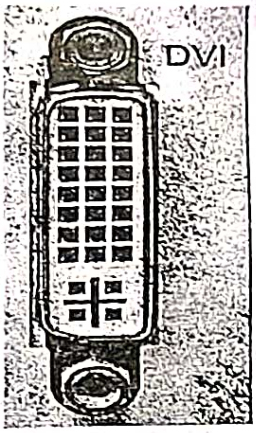
It supports multiple audio formats, including stereo and multi-channel surround sound.

Q13. What do you mean by Digital Visual Interface (DVI).

Ans. A digital visual interface (DVI) is a port used to connect display devices, such as LCD monitors or projectors, with the output device. DVI only supports connections between digital-to-digital devices.

Industry group Digital Display Working Group (DDWG) developed DVI, which began as a way to get rid of legacy video display systems based on analog technology. Uncompressed data is sent out over DVI for display on specific display devices.

DVI was designed to transfer digital data from computers to display device such as LCD monitors or projectors. The transmitted data is always in binary form. After transferring, each pixel from the source device is reflected the same way on display side.



This is different from analog systems, where noise and electric attenuation affects the resulting image on the output display. DVI also has the ability to reduce overall power consumption.

Q14. Describe CD and DVD players.

Ans. CD/DVD PLAYER SYSTEM : The advanced form phono-record is a compact disc player. The CD/DVD player is composed of complicated electronic circuits. The package of electronic circuits is placed inside an outer insulating casing. On the front panel of casing the buttons are placed for various operations. The CD/DVD player is used for playing the data as well as to write the data on the CD/DVD. It has pits and bumps on their track which holds the data that needs to be played. These data can be audio, video or both. While reading the CD/DVD, pits are considered as '1' and bumps are as '0'.

Parts of a CD/DVD Player

1. **Disc Drive Mechanism :** It consists of a disc loading tray and a motor. In disc loading tray we load the CD/DVD then motor is used to rotate the CD/DVD in circular motion. The proper rotation of the CD/DVD is carried out with the

help of spindle, gears and belt that are attached internally in the system.

2. **Optical System :** The optical system needs motor for the movement of lenses, mirror, laser beams, prism and photo-detector. There operation is to provide input to the disc-drive. They are assembled in a glass case.
3. **Printed Circuit Board :** It is an electronic circuit board. It contains various electronics components such as IC's, resistors, Capacitors etc. They are mounted on the board with proper soldering. The circuit is designed to perform the required application.

Working Principle and Block Diagram of CD/DVD Player : The simplest block diagram of CD recorder is shown in Fig. The electrical information signal is fed to the amplifier. The amplified version of electrical signal is the input to the analog to digital converter (ADC). It converts continuous electrical signal into the equivalent digital signal. It is operating at the sampling frequency, which is double to the input frequency. The next stage is multiplexer stage, which combines the digital data with error control, control and sync word to give output which is the input for the laser unit.

Thus, the input to the laser unit is the single interleaved digital signal. Laser unit is exposed to the photo resistive master disc. The material of this disc is highly sensitive to the laser beam.Hence, according to the data to be recorded is then recorded on the CD and is used for the mass production for commercial application of CDs.

The **block diagram** explains the operational function of the CD/DVD reproduction as shown in Fig. The portion hit by pits and bumps of laser beam, resulting reflection is changed accordingly.

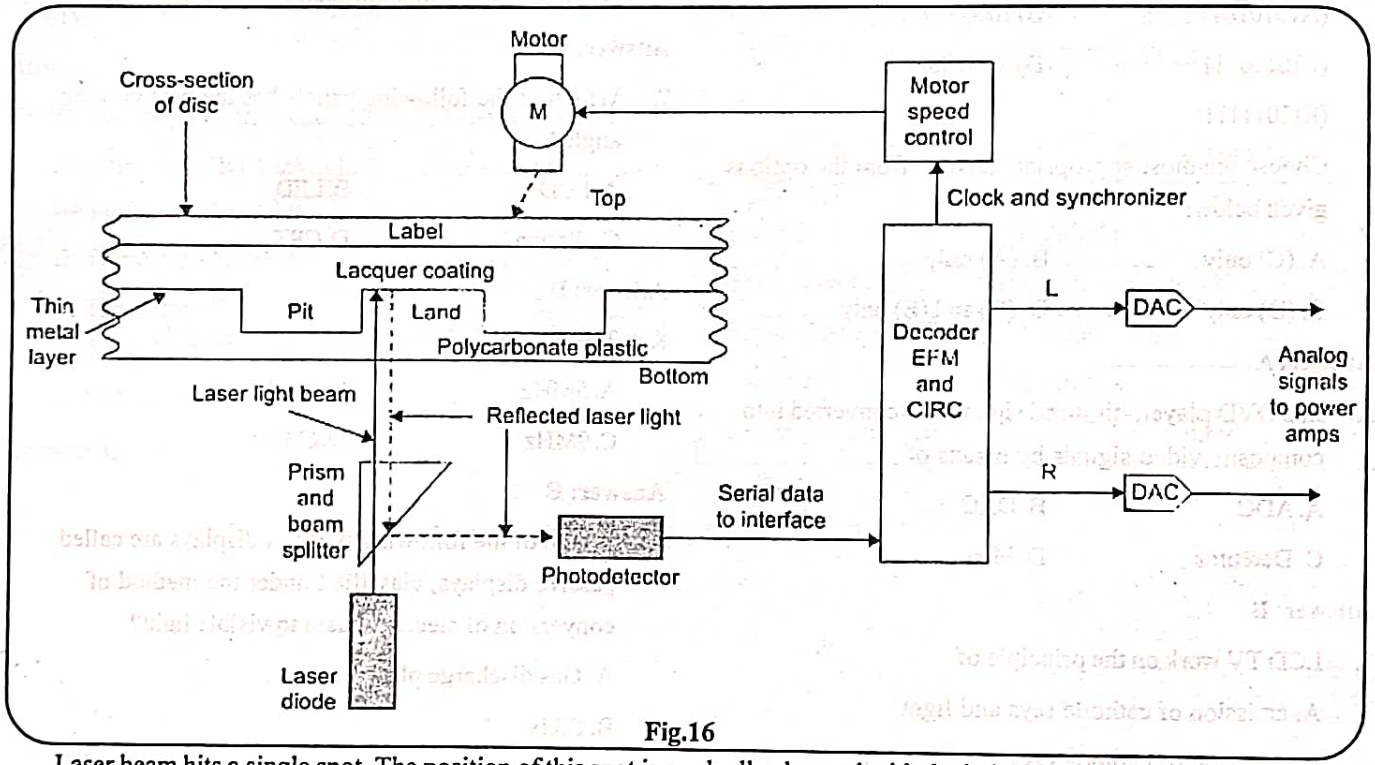


Fig.16

Laser beam hits a single spot. The position of this spot is gradually changed with the help of mirror and the circular motion of the disc provides the coverage of entire CD/DVD by the laser beams. These reflected beams from the CD/DVD are collected by photo-detector.Since pits and bumps reflect two kind of laser beams that are collected by photo-detector in binary code (digital signal).

The digital signal is then converted into analog signal with help of digital to analog converter (DAC). This DAC is an electronic circuit mounted on the PCB to perform this task. The analog signal is further amplified by amplifier, which is also mounted on PCB. Thus the amplified signal is obtained at the output. This signal is fed to the audio/graphic unit. The audio/ graphic unit gives us audio or video output.

Advantages

1. It saves time when backup is taken by the system. The time is saved due to the backup

is taken once and can't be changed continuously.

2. It is easy to locate backup files on the disc.
3. It provides back of several kinds of files.
4. Can be used to copy files from the directories.
5. Write protection is available.

Disadvantages

1. Can't be used to spread a backup job on several disc.
2. Whole of the space in disc can't be utilized for backup.
3. Software is required for the write operation of disc.

OBJECTIVE QUESTIONS ANSWERS

1. For the 40-character wide LCD, the upper address range can go as high as:

   (A) 0101011 (B) 1000000

   (C) 0100111 (D) 1001000

   (E) 1011111

   Choose the most appropriate answer from the options given below:

   A. (C) only B. (A) only

   C. (D) only D. (B) and (E) only

Answer: A

2. In a DVD player, digitised signals are converted into composite video signals by means of

   A. ADC B. DAC

   C. Detcotor D. Mixer

Answer: B

3. LCD TV work on the principle of

   A. emission of cathode rays and light

   B emission of cathode rays

   C. light emission

   D. light blockage

Answer: D

4. In a display specified as 600 x 400 the number of pixels across the display screen is

   A. 600 B. 400

   C. 240000 D. none of the above

Answer: C

5. TV receiver the electron beam is deflected by

   A. Electromagnetic deflection

   B. Electrostatic deflection

   C. Any of the two

   D. None

Answer: A

6. What is a DISADVANTAGE of LCD displays?

   A. It consumes less power

   B. LCDs are cheaper

   C. LCDs provide good contrast

   D. They require an additional light source

Answer: D

7. Which of the following panels has the best viewing angle?

   A. LCD B. LED

   C. Plasma D. CRT

Answer: D

8. The band Width of a Television channel is

   A. 5MHz B. 7MHz

   C. 9MHz D. 6MHz

Answer: B

9. Which of the following types of displays are called passive displays, classified under the method of conversion of electrical data to visible light?

   A. Gas discharge plasma

   B. CRTs

   C. LCDs D. LEDs

Answer: C

10. Which process is used to backlight an LCD monitor?

    A. White or RGB B. Halogen bulb

    C. Fluorescent tube D. Plasma panel

Answer: A

11. Between which two sheets is an LCD screen sandwiched?

A. Two plastic sheets

B. Two paper sheets

C. Two LCD screen sheets

D. Horizontal and vertically polarised sheet

Answer: D

12. Identify the WRONG statement from the options given below.

A. In LED TV, the LEDs can be placed on the edges too.

B. Both LCD and LED TVs use an LCD screen for display.

C. LEDs are used for backlighting the LCD screen of LED TV.

D. CFLs are used for backlighting the LCD screen of LED TV

Answer: C

13. What is the main difference between LED and LCD TV?

A. There is a CRT backlight in spite of the fluorescent backlight in an LED TV.

B. There is no difference

C. There is an LED backlight in spite of the fluorescent backlight in an LED TV.

D. LED is cheaper than LCD

Answer: C

Advantages of LCD	Disadvantages of LCD
Extremely high resolution	In high-temperature environments, there is a loss of contrast
It has no geometric distortion	Limited viewing angle and brightness
It is very compact thin, and fight CRT displays	It requires an additional light source
It does not affect by the magnetic fields	It consumes a lot of electricity which produces a lot of heat
Due to tow power consumption, small heated emitted during operation	It has individually liquid crystals which can't complete all block of the backlight

Comparison between LED TV and LCD TV

LED TV	LCD TV
LED : Light emitting diode	LCD: Liquid crystal display
It is pn junction device	LCD is an optical device
LED TV uses LEDs backlight	LCD TV use fluorescent backlight
Better picture quality	Not up to the level
Thinner than LCD TV	Thicker in size
Very costly	Less costly
More power required	Less Power required

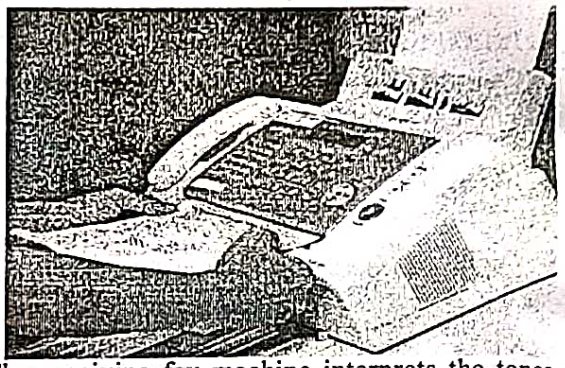
UNIT 05

Home/Office Appliance

Q.1. What do you mean by FAX. Draw the appropriate block diagram for FAX process.

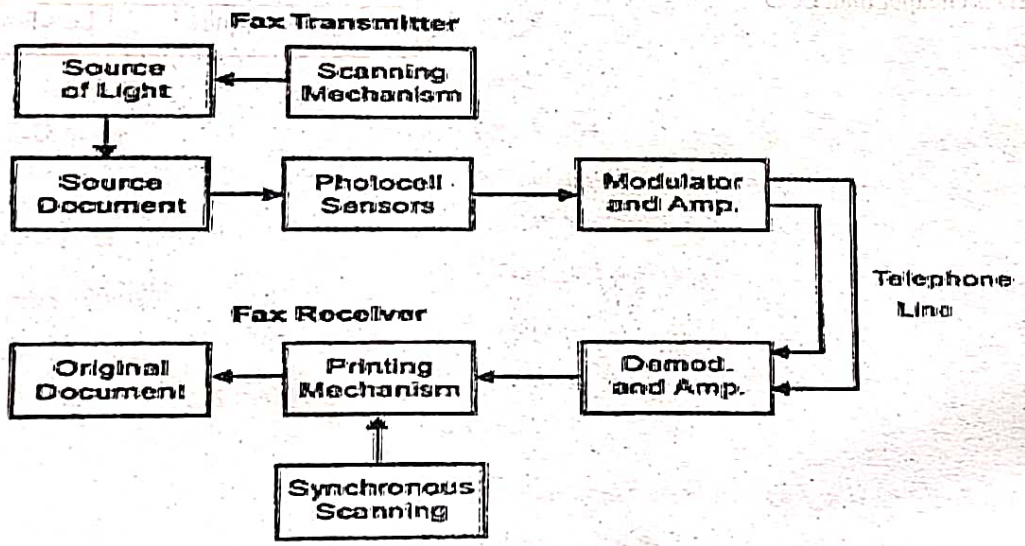
Or, Explain the Working Principle of FAX machine.

Ans. Fax (short for facsimile), sometimes called telecopying or telefax (the latter short for telefacsimile), is the telephonic transmission of scanned printed material (both text and images), normally to a telephone number connected to a printer or other output device. The original document is scanned with a fax machine (or a telecopier), which processes the contents (text or images) as a single fixed graphic image, converting it into a bitmap, and then transmitting it through the telephone system in the form of audio-frequency tones.



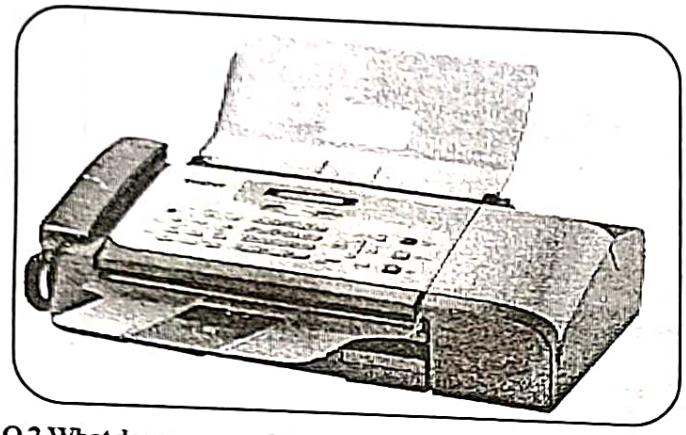
The receiving fax machine interprets the tones and reconstructs the image, printing a paper copy.Early systems used direct conversions of image darkness to audio tone in a continuous or analog manner. Since the 1980s, most machines modulate the transmitted audio frequencies using a digital representation of the page which is compressed to quickly transmit areas which are all-white or all-black.

Block Diagram for the FAX Process:



Working Principle of FAX machine: The working principle of the fax machine is very simple, that is to scan the file that will be sent and convert it into a series of black and white point information, which is then converted into sound frequency signal and transmitted through the traditional telephone line. After receiving the fax, the receiver will print out the corresponding point information, so that the receiver will receive a copy of the original transmission document. But the four fax machines

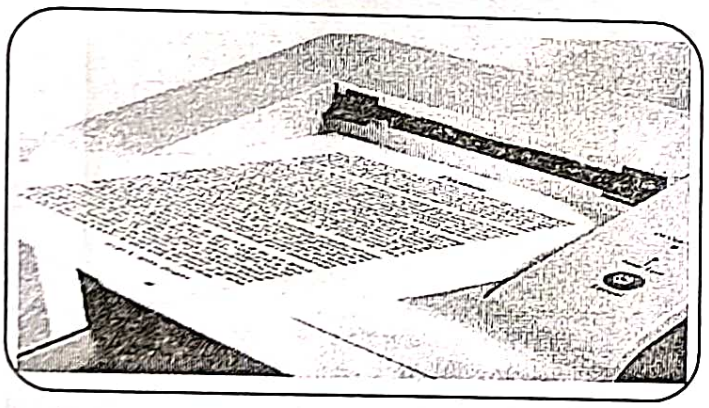
have different ways of printing after receiving the signals, and their differences in working principles are basically in these respects.



Q.2. What do you mean photocopier. Draw the appropriate block diagram for photocopier process.

Or, Explain the Working Principle of photocopier machine.

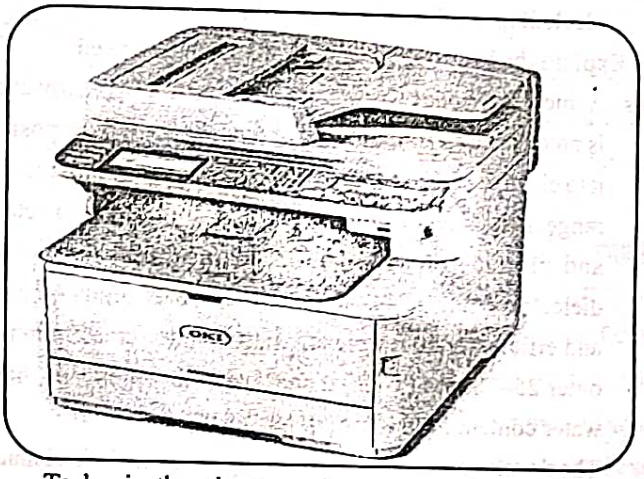
Ans. A photocopier (also called copier or copy machine, and formerly Xerox machine, the generic trademark) is a machine that makes copies of documents and other visual images onto paper or plastic film quickly and cheaply. Most modern photocopiers use a technology called xerography, a dry process that uses electrostatic charges on a light-sensitive photoreceptor to first attract and then transfer toner particles (a powder) onto paper in the form of an image. The toner is then fused onto the paper using heat, pressure, or a combination of both. Copiers can also use other technologies, such as inkjet, but xerography is standard for office copying.



Commercial xerographic office photocopying was introduced by Xerox in 1959,and it gradually replaced copies made by Verifax, Photostat, carbon paper, mimeograph machines, and other duplicating machines. Photocopying is widely used in the business, education, and government sectors. While there have been predictions that photocopiers will eventually become obsolete as information workers increase their use of digital document creation, storage, and distribution and rely less on distributing actual pieces of paper, as of 2015, photocopiers continue to be widely used. During the 1980s, a convergence began in some high-end machines towards what came to be called a multi-function printer: a device that combined the roles of a photocopier, a fax machine, a scanner, and a computer network-connected printer. Low-end machines that can copy and print in color have increasingly dominated the home-office market as their prices fell steadily during the 1990s. High-end color photocopiers capable of heavy-duty handling cycles and large-format printing remain a costly option found primarily in print and design shops.

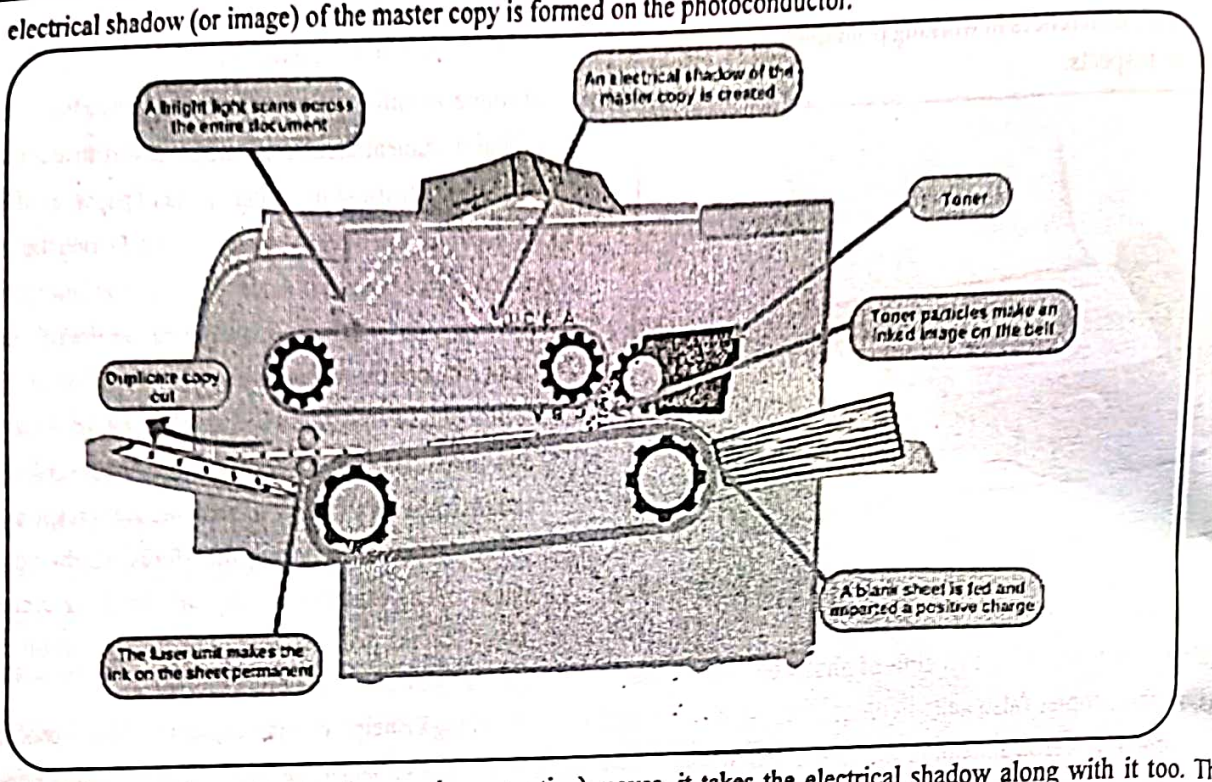
Working Principle of photocopier machine: A photocopier works on two fundamental principles: the fact that opposite charges attract and the tendency of certain materials to become more electrically conductive after absorbing electromagnetic radiation, such as UV, infrared, visible light etc. (photoconductivity).

Most modern photocopiers rely on a technology known as xerography, which is essentially a dry photocopying technique. It involves using electrically-charged particles to attract and then deposit toner particles onto a piece of paper.



To begin the photocopying process, the top lid of the photocopier is opened and the master copy is placed face-down on the glass surface, where a bright light beam will scan the entire document. White areas on the paper reflect more light, while black areas reflect little or no light. An

electrical shadow (or image) of the master copy is formed on the photoconductor.



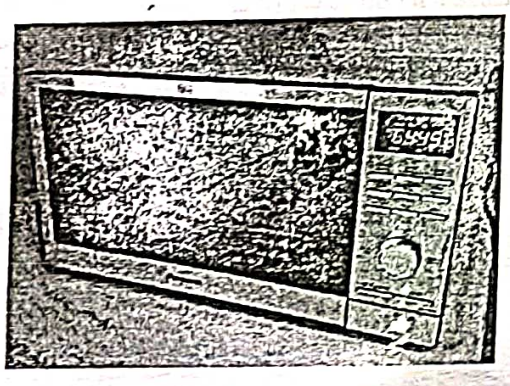
As the conveyor belt (with the photoconductor coating) moves, it takes the electrical shadow along with it too. The negatively-charged toner particles stick to the electrical shadow and an inked impression of the master copy is made on the conveyor belt.A blank piece of paper is fed into the photocopier from the other side, which slowly moves towards the photoconductor belt. As it moves on the conveyor belt, a strong positive charge is imparted to it. The strong positive charge of the blank paper pulls the negatively-charged toner particles towards itself. Consequently, a duplicate image of the master copy is formed on the blank paper.Finally, just before spitting the paper out, a fuser unit (a pair of hot rollers) supply heat and pressure so the toner particles are permanently attached/fused onto the paper. This is why a freshly ejected duplicate copy is quite warm to the touch

Q.3. What do you mean microwave oven. Draw the appropriate block diagram for microwave oven

Or, Explain the Working Principle of microwave oven

Ans. A microwave oven (commonly referred to as a microwave) is an electric oven that heats and cooks food by exposing it to electromagnetic radiation in the microwave frequency range.This induces polar molecules in the food to rotate and produce thermal energy in a process known as dielectric heating. Microwave ovens heat foods quickly and efficiently because excitation is fairly uniform in the outer 25–38 mm (1–1.5 inches) of a homogeneous, high water content food item.

The development of the cavity magnetron in the UK made possible the production of electromagnetic waves of a small enough wavelength (microwaves). American engineer Percy Spencer is generally credited with inventing the modern microwave oven after World War II from radar technology developed during the war. Named the "Radarange", it was first sold in 1946.



Microwave ovens are a common kitchen appliance and are popular for reheating previously cooked foods and cooking a variety of foods. They rapidly heat foods which can easily burn or turn lumpy if cooked in conventional pans, such as hot butter, fats, chocolate or porridge. Microwave ovens usually do not directly brown or caramelize food, since they rarely attain the necessary

temperature to produce Maillard reactions.

Block diagram for microwave oven:

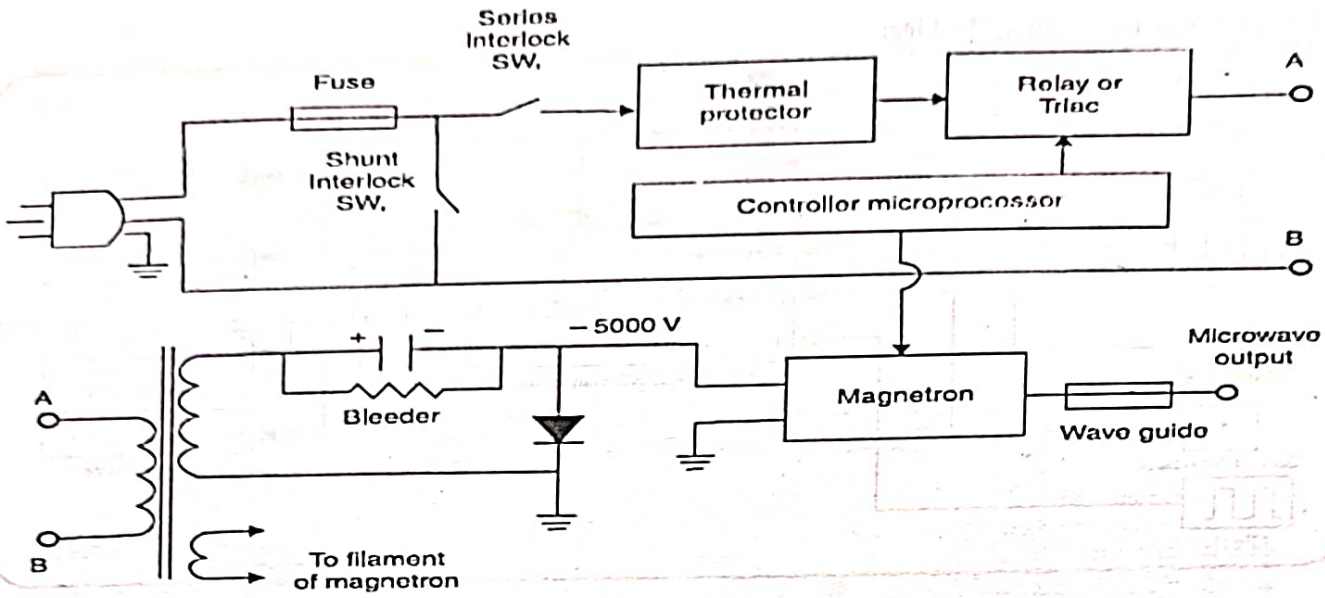


Fig. Block diagram for microwave oven

Working Principle of Microwave Oven:

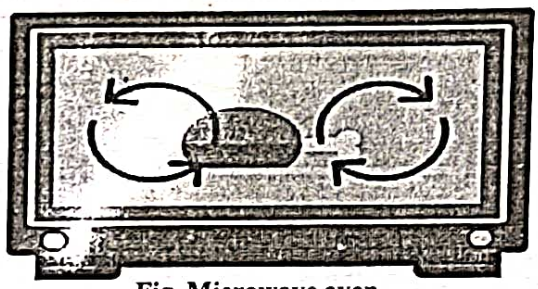


Fig. Microwave oven

Microwave ovens work on the principle of conversion of electromagnetic energy into thermal energy. Electromagnetic (EM) energy refers to the radiation (waves) comprising an electrical field and magnetic field oscillating perpendicular to each other. When a polar molecule, i.e., a molecule containing opposite charges, falls in the path of these EM radiations, it oscillates to align with them. This causes the energy to be lost from the dipole by molecular friction and collision, resulting in heating. The water molecules present inside our food products go under a similar phenomenon when they come in contact with microwave radiations, heating the food from inside out. Microwaves are electromagnetic radiations with frequencies between 300MHz (0.3 GHz) and 300 GHz, and the corresponding wavelengths ranging from 0.9m to .0009m, respectively. In most of the ovens, the microwave used is of 2.24GHz frequency (i.e., wavelength = 12.2cm). These dimensions allow microwaves to penetrate deep inside the food and cook it from inside, while the temperature of the air present around the food remains constant as air is nonpolar. There is a common misconception that microwaves in a microwave oven excite a natural resonance in water. The frequency of a microwave oven is well below any natural resonance in an isolated water molecule, and in liquid water, those resonances are so smeared out that they're barely noticeable anyway.

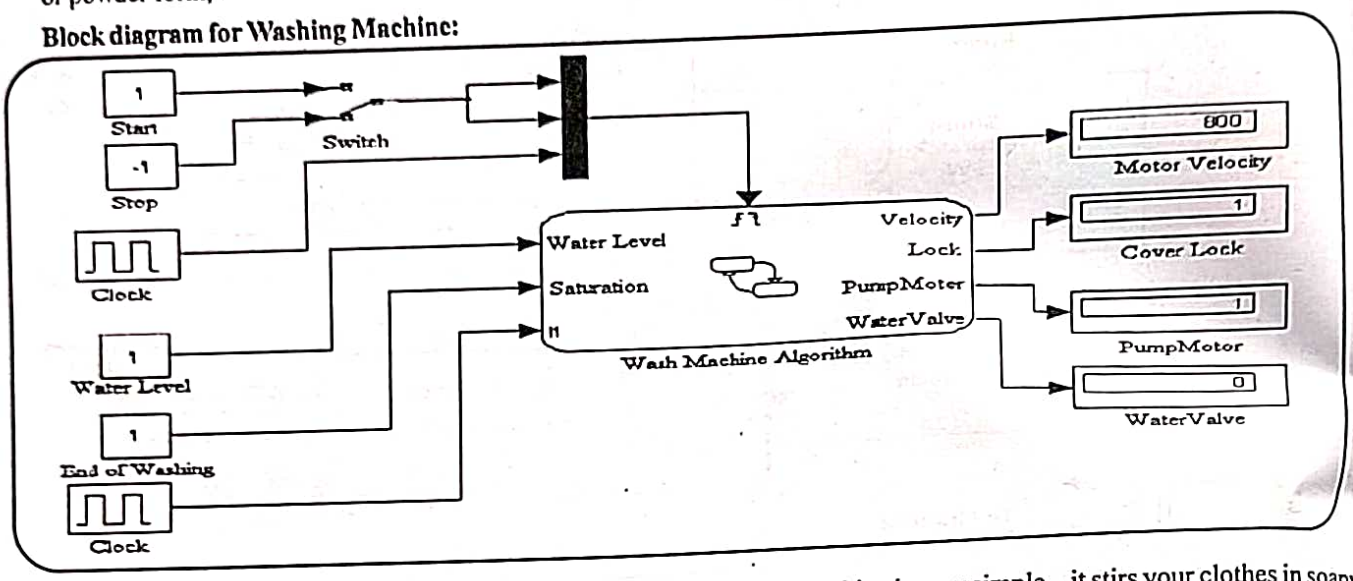
Q.4. What do you mean Washing Machine. Draw the appropriate block diagram for Washing Machine ?

Or, Explain the Working Principle of Washing Machine ?

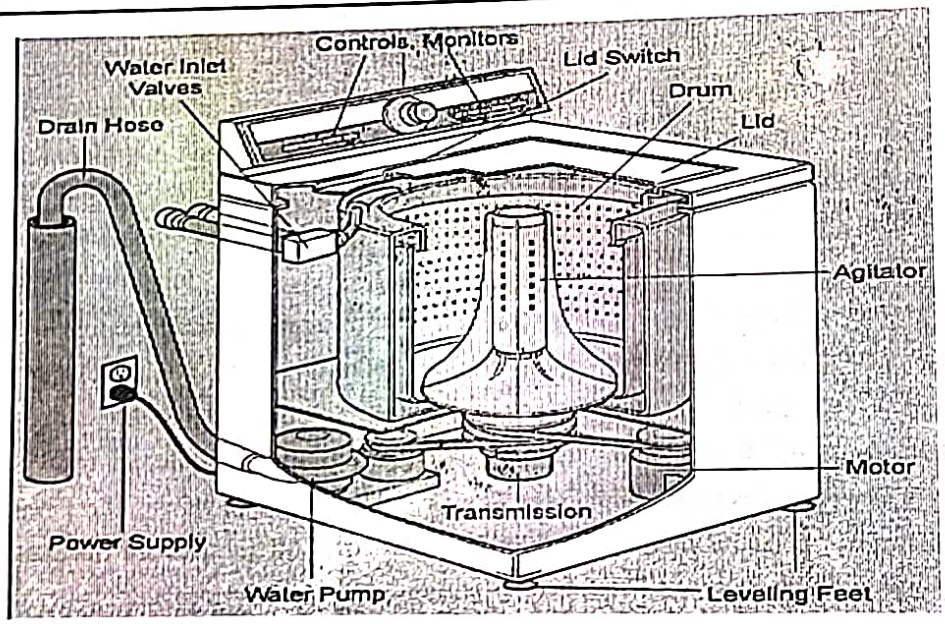
Ans. A washing machine (laundry machine, clothes washer, washer, or simply wash) is a home appliance used to wash laundry.

The term is mostly applied to machines that use water as opposed to dry cleaning (which uses alternative cleaning fluids and is performed by specialist businesses) or ultrasonic cleaners. The user adds laundry detergent, which is sold in liquid or powder form, to the wash water.

Block diagram for Washing Machine:



Working Principle of Washing Machine: The concept of the washing machine is very simple – it stirs your clothes in soapy lather and water to remove any dirt and stains before spinning to remove the water after the cycle. The main component of a washing machine is the drum, which is filled with water, but did you know that washing machines actually have two drums.



The working principle of a washing machine is the centrifugal and centripetal forces. Washing machines operate in two primary cycles. These are the wash cycle and the rinse cycle. The wash cycle involves the principle of centrifugal force. The direction of this force is from the inside to the outside, which ensures that every part of the fabric is thoroughly washed in soapy water added to the machine. The rinse cycle involves the principle of centripetal force. This force acts from the outside to the inside and creates a vacuum-like space in the middle of the washing machine.

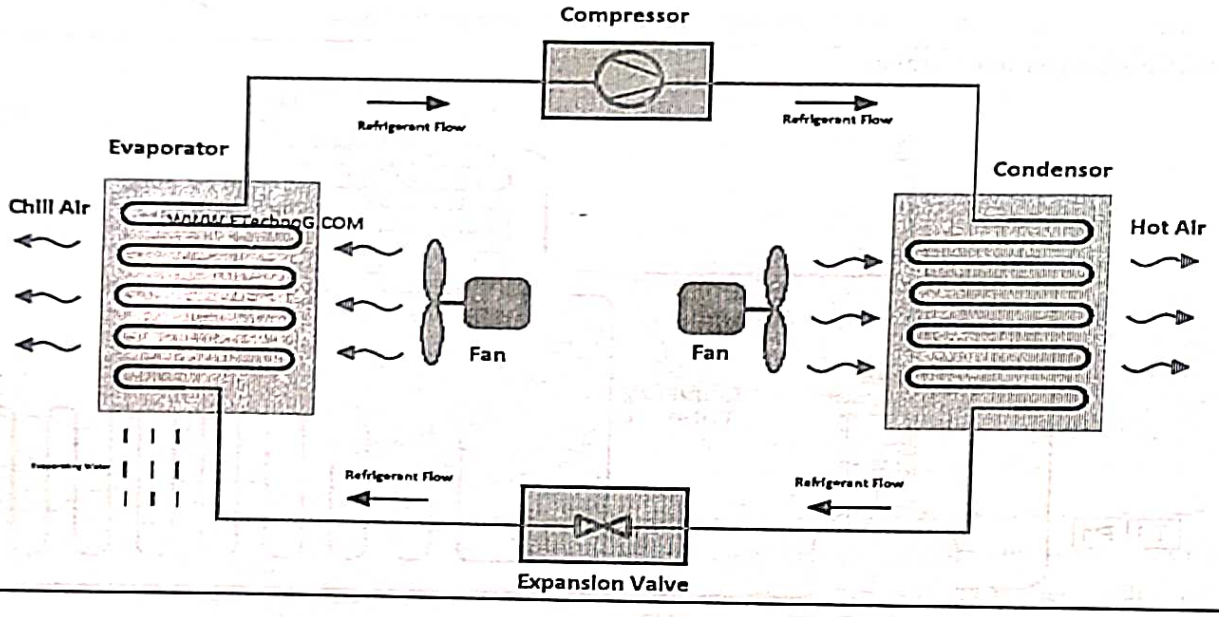
Q.5. What do you mean Air conditioner. Draw the appropriate block diagram for Air conditioner

Or, Explain the Working Principle of Air conditioner.

Ans. Air conditioning, often abbreviated as A/C or AC, is the process of removing heat from an enclosed space to achieve a more comfortable interior environment (sometimes referred to as 'comfort cooling') and in some cases also strictly controlling the humidity of internal air. Air conditioning can be achieved using a mechanical 'air conditioner' or alternatively a variety of other methods, including passive cooling and ventilative cooling. Air conditioning is a member of a family of systems and techniques that provide heating, ventilation, and air conditioning (HVAC). Heat pumps are similar in many ways to air conditioners, but use a reversing valve to allow then to both heat and also cool an enclosed space.

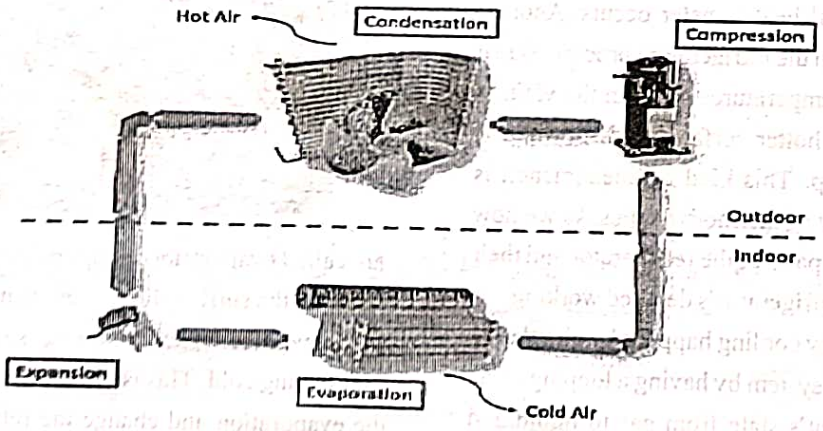
Air conditioners, which typically use vapor-compression refrigeration, range in size from small units used within vehicles or single rooms to massive units that can cool large buildings. Air source heat pumps, which can be used for heating as well as cooling, are becoming increasingly common in cooler climates.

Block diagram for Air conditioner:



Working Principle of Air conditioner: The principle of air conditioning is based on the laws of thermodynamics. An air conditioner operates using the refrigeration cycle. Specific refrigerants are needed as the working fluid in the refrigeration cycle.

An air conditioner goes through 4 processes; compression, condensation, expansion, and evaporation. Typically, an air conditioner is made up of 4 major components; compressor, heat exchanger, fan, and expansion valve.



AC Working Principle with Components : In an air cond tioning system, pipes are needed to transfer heat energy from indoor to outdoor. Insulation is always required in an air conditioning system to prevent energy loss.

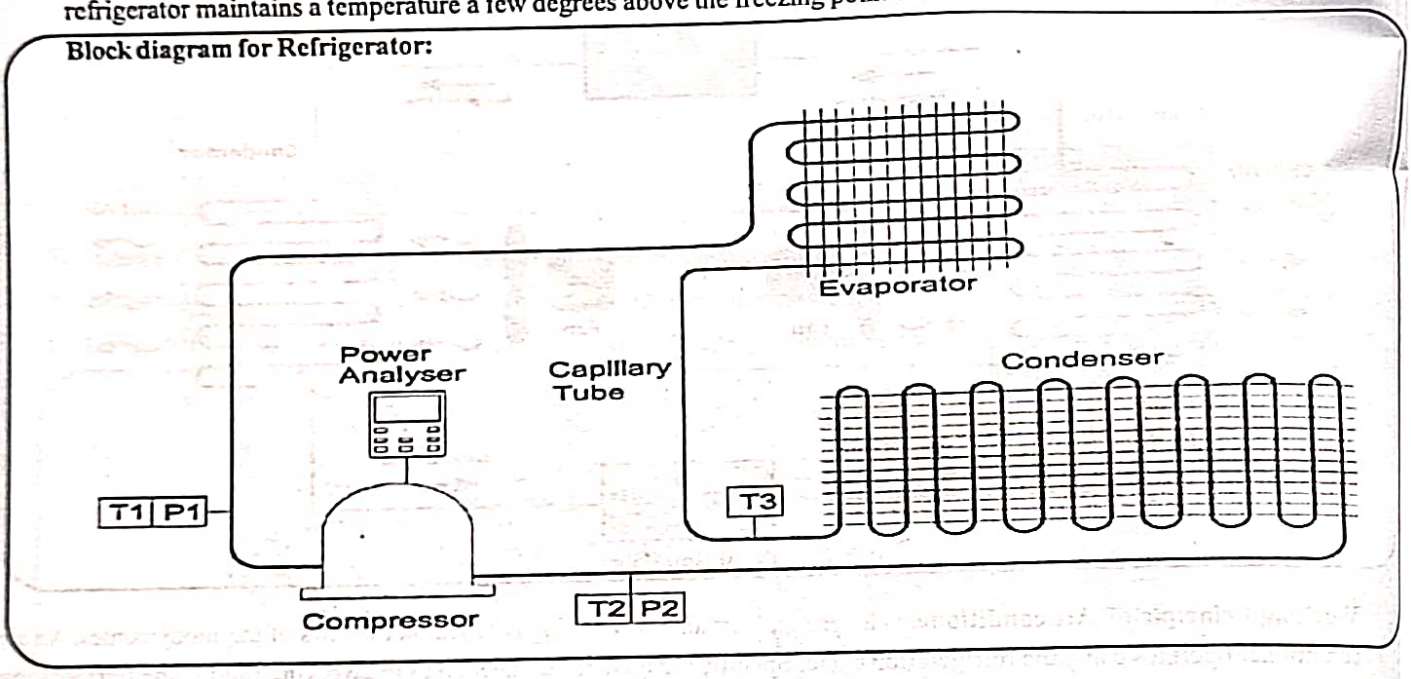
An air conditioner not just cools or reduces the temperature of the air, it also dehumidifies the air to a level that is comfortable to humans. An air conditioner also provides a certain degree of air filtration during the cooling process.

Q.6. What do you mean Refrigerator. Draw the appropriate block diagram for Refrigerator

Or, Explain the Working Principle of Refrigerator

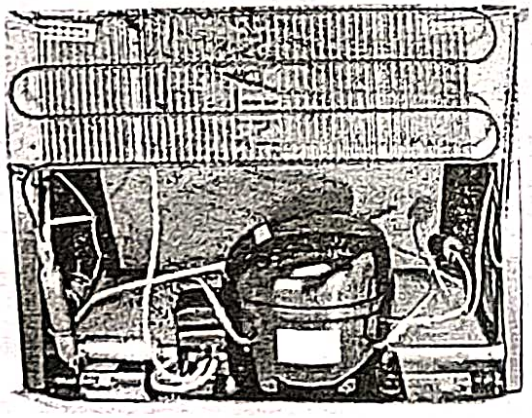
Ans. A refrigerator, colloquially fridge, is a commercial and home appliance consisting of a thermally insulated compartment and a heat pump (mechanical, electronic or chemical) that transfers heat from its inside to its external environment so that its inside is cooled to a temperature below the room temperature. Refrigeration is an essential food storage technique around the world. The lower temperature lowers the reproduction rate of bacteria, so the refrigerator reduces the rate of spoilage. A refrigerator maintains a temperature a few degrees above the freezing point of water

Block diagram for Refrigerator:



Working Principle of Refrigerator: The main principle behind the refrigerator's working is that a gas or a liquid changes its temperature when forced through a capillary tube or an expansion valve, separately kept in an insulated system where no external heat transfer occurs. Another principle comes to work in the refrigeration process. When two things in different temperatures come in the vicinity or physical contact, the hotter surface cools down, and the cooler body heats up. This kind of phenomenon is known as the second law of thermodynamics.As we now know about the different parts of the refrigerator and their working, let's look at a refrigerator's detailed working.

The refrigerator's primary cooling happens by circulating the refrigerant inside the system by having a looping cycle of shifting the refrigerant's state from gas to liquid and then again from liquid to gas.The steps by which this occurs



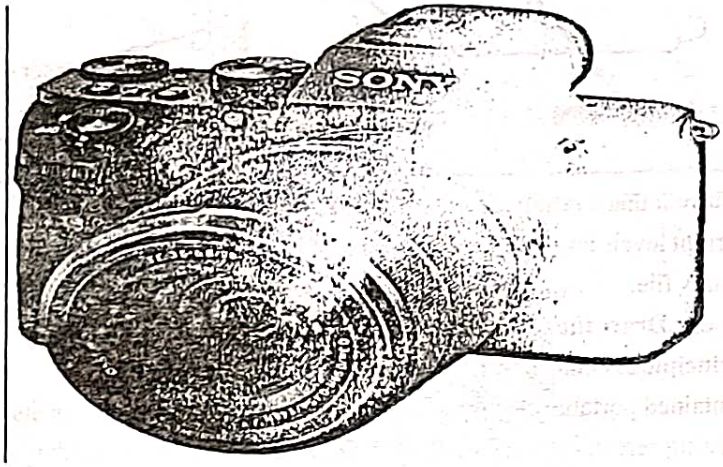
are called evaporation. Evaporation always has a cooling effect on the surroundings. For example, when you sweat and then go sit under a fan, your sweat dries up, and you start feeling cold. This is also due to evaporation. To start the evaporation and change the refrigerant's state, there is a need to lower the refrigerant's pressure. The lower

of pressure is done by passing it through an outlet called a capillary tube. The phenomenon happening here is similar to the one which occurs when you apply an aerosol product like a hair spray. The aerosol content is the liquid side, the outlet is the capillary tube, and the open space is synonymous with the evaporator. When we release the content in the lower pressure zone of free space, it changes its state from liquid to gas.

Q.7. What do you mean Digital camera. Draw the appropriate block diagram for Digital camera

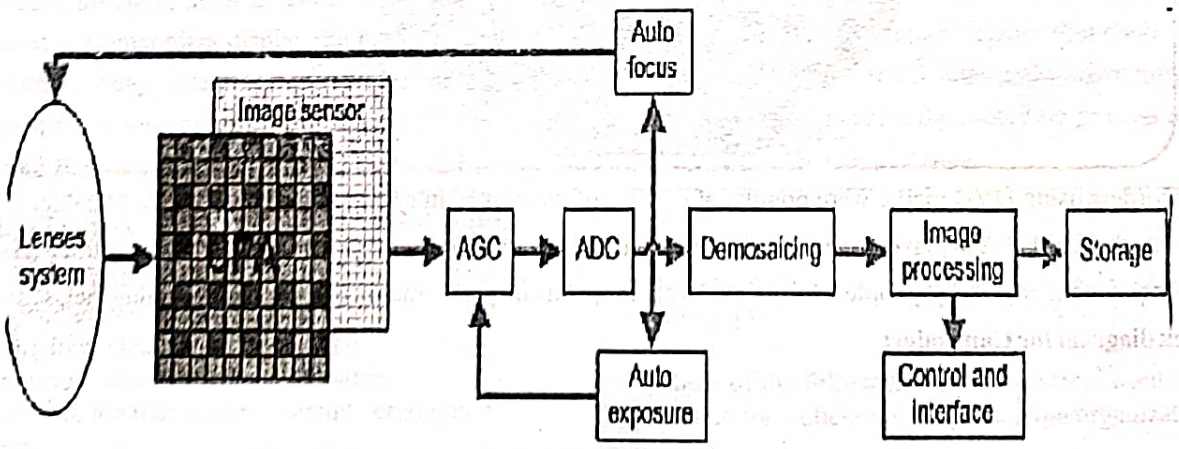
Or, Explain the Working Principle of Digital camera

Ans. A digital camera is a camera that captures photographs in digital memory. Most cameras produced today are digital, largely replacing those that capture images on photographic film. Digital cameras are now widely incorporated into mobile devices like smartphones with the same or more capabilities and features of dedicated cameras. While there are still dedicated digital cameras, many more cameras are now incorporated into mobile devices like smartphones.

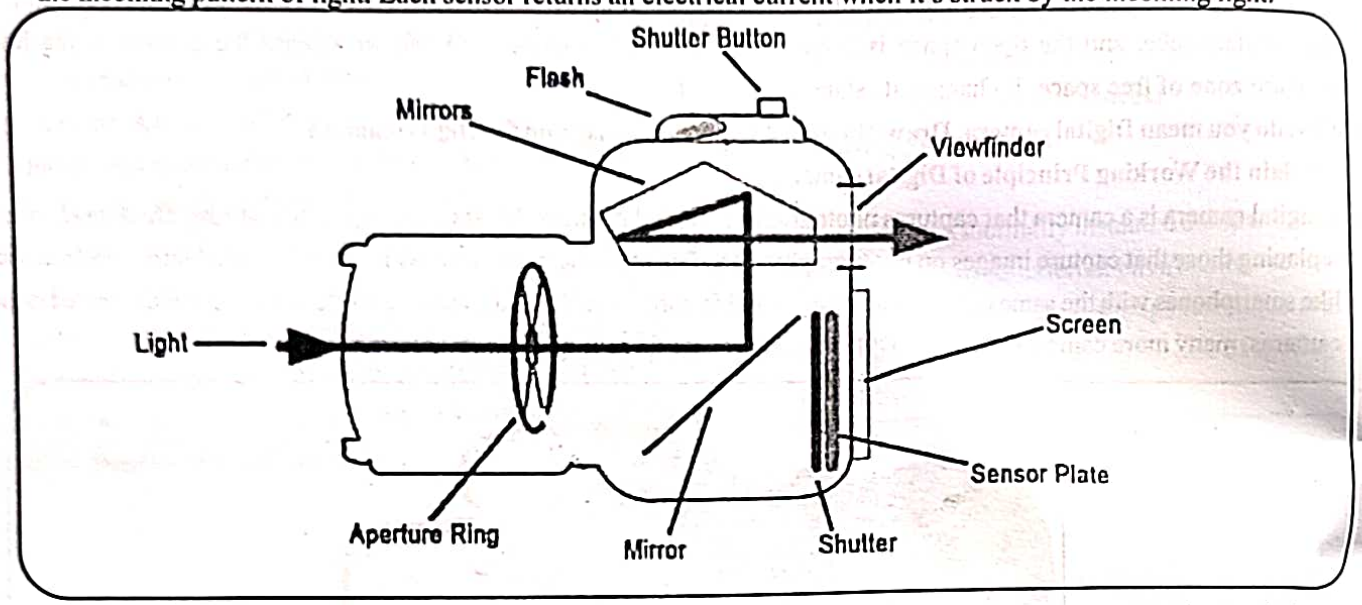


High-end, high-definition dedicated cameras are still commonly used by professionals and those who desire to take higher-quality photographs.Digital and digital movie cameras share an optical system, typically using a lens with a variable diaphragm to focus light onto an image pickup device.The diaphragm and shutter admit a controlled amount of light to the image, just as with film but the image pickup device is electronic rather than chemical. However, unlike film cameras, digital cameras can display images on a screen immediately after being recorded, and store and delete images from memory. Many digital cameras can also record moving videos with sound. Some digital cameras can crop and stitch pictures and perform other elementary image editing.

Block diagram for Digital camera:



Working Principle of Digital camera: Digital camera is an combination of array of photoelectric sensor, and the same reco the incoming pattern of light. Each sensor returns an electrical current when it's struck by the incoming light.

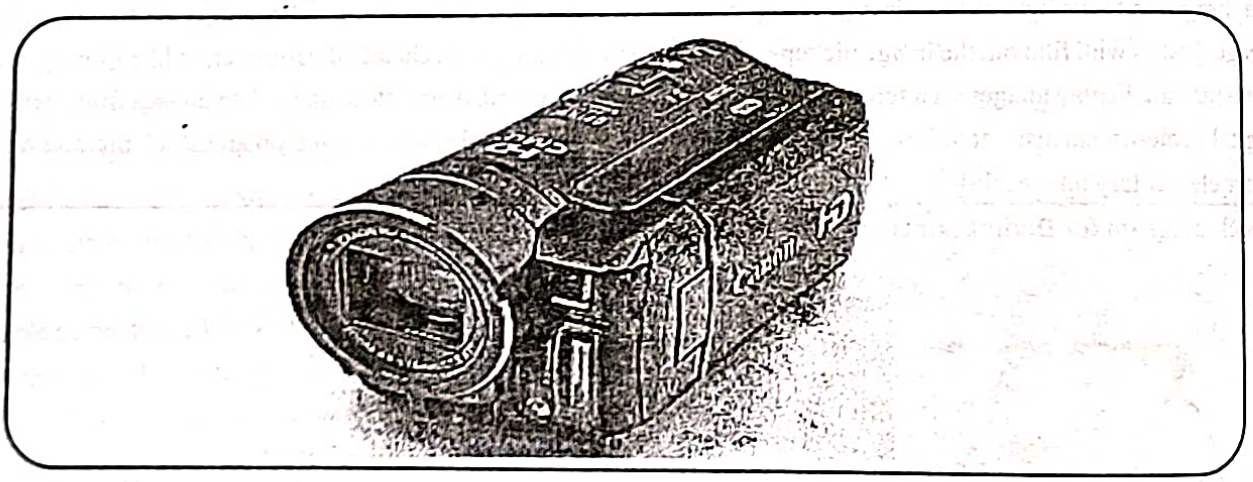


Because the amount of current that's returned varies with the amount of light, your digital camera's electronic innards co combine the different current levels into a composite pattern of data that represents the incoming light — in other words, a image in the form of a binary file.

Q.8. What do you mean camcoder. Draw the appropriate block diagram for camcoder. ?

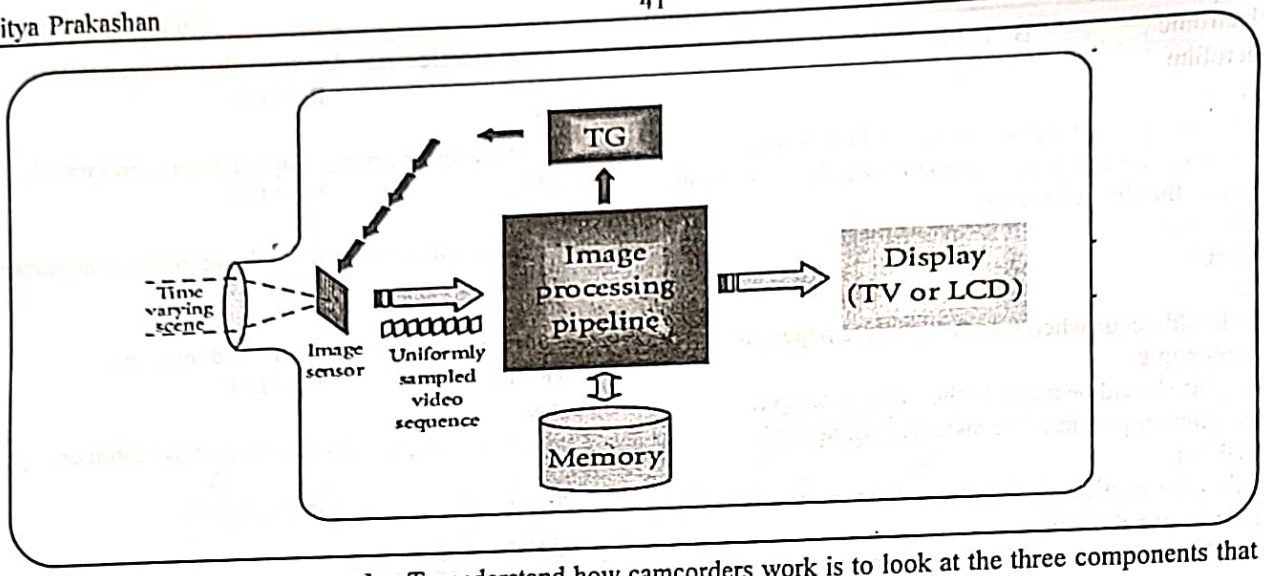
Or, Explain the Working Principle of camcoder. ?

Ans. A camcorder is a self-contained portable electronic device with video and recording as its primary function. It is typicall equipped with an articulating screen mounted on the left side, a belt to facilitate holding on the right side, hot-swappabl battery facing towards the user, hot-swappable recording media, and an internally contained quiet optical zoom lens. Th earliest camcorders were tape-based, recording analog signals onto videotape cassettes. In 2006, digital recording becam the norm, with tape replaced by storage media such as mini-HD, microDVD, internal flash memory and SD cards.

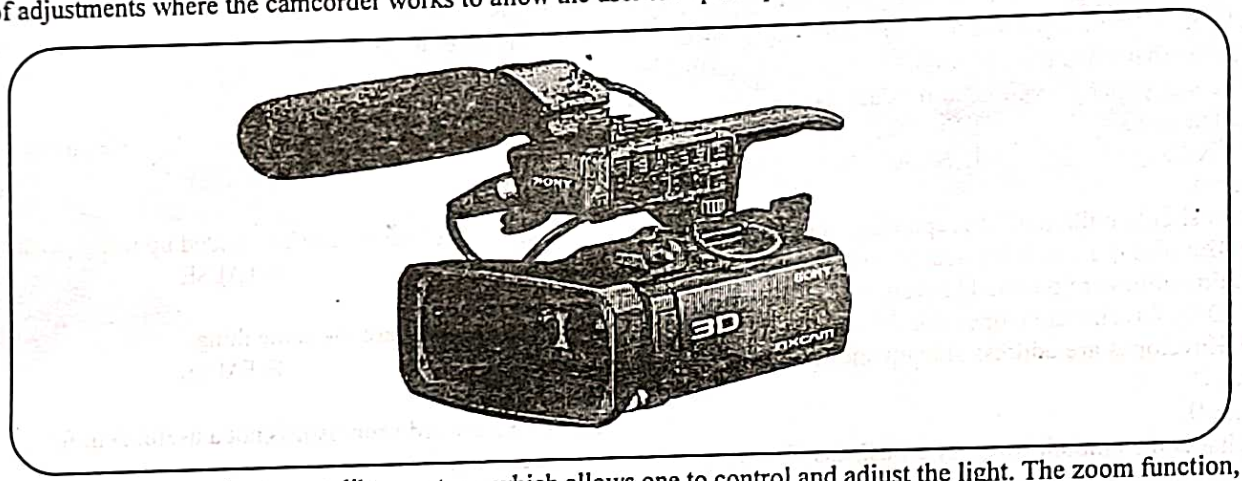


Camcorders using DVD media were popular at the turn of the 21st century due to the convenience of being able to drop disc into the family DVD player; however, DVD capability, due to the limitations of the format, is largely limited to consume level equipment targeted at people who are not likely to spend any great amount of effort video editing their video footag

Block diagram for Camcoder:



Working Principle of camcoder: To understand how camcorders work is to look at the three components that they are comprised of: Lens, Imager and Recorder. The lens of a camcorder is the light path of the camera that consists of a number of adjustments where the camcorder works to allow the user to capture pictures and videos exactly as desired.



These adjustments include parts like aperture, which allows one to control and adjust the light. The zoom function, that is used to adjust the field-view area covered by the lens. And the shutter speed that helps capture any form of motion. The imager, which is the camcorders eye, works by housing the photosensitive devices. This is how camcorders work to develop the electronic video signal from the light captured in quite a complex electronic process. How camcorders work for recording is the recorder, which, provides complex signaling functions that capture the video signals and transfers them to the recording medium, such as DVD. The recording and storage device is an important feature to the usability of camcorders. Camcorders display the recorded images via the magnificent flat LCD screen feature that comes with most camcorders today. These screens can be rotated about 290 degrees along the vertical line, and horizontally about 90 degrees. These screens have made digital camcorders very popular by consumers since the recording process becomes so easy and fun when you are able to see what is being recorded on the LCD screen in real time.

OBJECTIVE QUESTIONS ANSWERS

1. What is an example of a workplace behavioral hazard?
   A. An overworked employee
   B. Fumes from cleaning agent spillage
   C. Exposure to electromagnetic radiation
   D. A workstation that does not include ergonomic furniture

Answer: A

2. What type of mail requires proof of delivery?
   A. Express Post B. international post
   C. Key post D. Registered post

Answer: D

3. Which of the following storage systems would be most suitable for a client register of a large organization?

A. Electronic B. Image based
C. Microfilm D. Paper based

Answer: A

4. Your stationary order was incorrectly filled. Which document would you use to compare with the order form to identify the discrepancies?
A. Credit note B. Delivery docket
C. Receipt D. Tax Invoice

Answer: B

5. What should occur when there is a simple paper jam in the photocopier?
A. A report should be made to the office manager.
B. The photocopier must be switched off at the PowerPoint.
C. Follow instructions in the photocopier manual or on the control panel display.
D. A call should be logged with the service Difficulties Department and the photocopier switched off.

Answer: C

6. You have been given a twelve-page document printed on A4 paper. You are printed to produce a double sided booklet that when folded will be A4 size. How many sheets of paper do you need for each booklet?
A. Three A3 B. Three A5
C. six A3 D. Six A4

Answer: A

7. How should bulk mail be prepared for posting?
A. Bundles must only be tied with string.
B. Envelopes are bundled in groups of 100.
C. Only DL size envelopes should be used.
D. Envelopes are address side up and facing the same way.

Answer: D

8 What is the amount owed by a business if it receives 2.5% discount on an invoice for $3560?
A. $89 B. $890
C. $3471 D. $3649

Answer: C

9 Offices have more or less the same layout in all companies.
A. True B. False

Answer: B

10 A large company may be divided into different departments.
A. TRUE B. FALSE

Answer: A

11. A secretary must be able to use a word processor.
A. TRUE B. FALSE

Answer: A

12. A PA does not need to be skilled in oral and written communication.
A. TRUE B. FALSE

Answer: B

13. Nowadays secretaries don't usually use typewriters.
A. TRUE B. FALSE

Answer: A

14. A secretary never arranges appointments and travel.
A. TRUE B. FALSE

Answer: B

15. In a modern office the role of the secretary is importa
A. TRUE B. FALSE

Answer: A

16. Secretarial staff file documents and invoices.
A. TRUE B. FALSE

Answer: A

17. A memo is a document which is sent to customers by post.
A. TRUE B. FALSE

Answer: B

18. Typewriters and shorthand are mostly a thing of the past.
A. TRUE B. FALSE

Answer: A

19. Secretaries do not keep diaries or send e-mails.
A. TRUE B. FALSE

Answer: B

20. Secretaries can often sign letters for their bosses.
A. TRUE B. FALSE

Answer: A

21. Large open offices can be divided up using partitions.
A. TRUE B. FALSE

Answer: A

22. Mail and post are the same thing.
A. TRUE B. FALSE

Answer: A

23. Using a word processor is not a useful skill for a secretary.
A. TRUE B. FALSE

Answer: B

24. Large companies do not use temps.
A. TRUE B. FALSE

Answer: B

25. Temp agencies have become popular in recent years.
A. TRUE B. FALSE

Answer: A

26. Working conditions in offices have improved in recent years.
A. TRUE B. FALSE

Answer: A

27. An accountant must always have his own office.
A. TRUE B. FALSE

Answer: B

28. Sales and Marketing are different departments in a lar company.
A. TRUE B. FALSE

Answer: A