WINTER– 14 EXAMINATION

Subject Code: **17537** **Model Answer**

Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.

2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.

3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.

4) While assessing figures, examiner may give credit for principal components indicated in the Figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.

5) Credits may be given step wise for numerical problems. In some cases, the assumed constant Values may vary and there may be some difference in the candidate's answers and model answer.

6) In case of some questions credit may be given by judgment on part of examiner of relevant answer based on candidate's understanding.

7) For programming language papers, credit may be given to any other program based on equivalent concept.

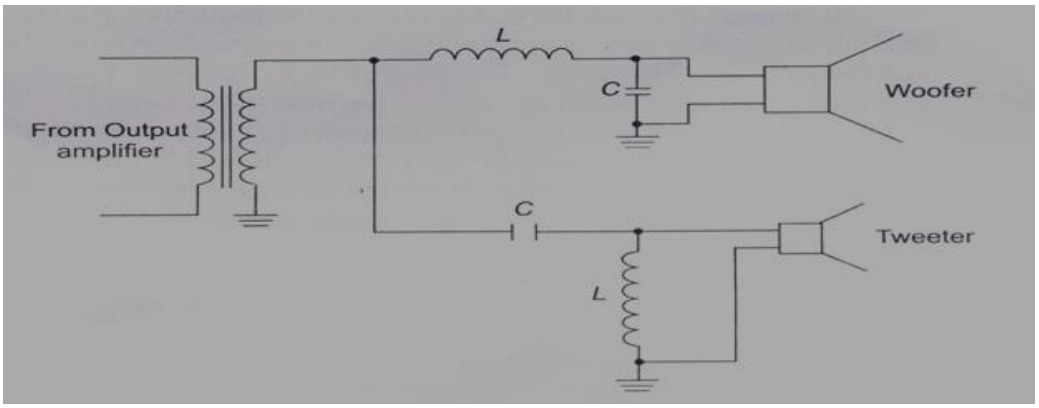
Q.1 a) Attempt any THREE of the following **(12 marks)**

i. State the necessity of cross over network. Draw the two way cross over network and explain its working.

Ans. **Necessity of Cross over Network** **(1 Mark)**

- A single cone type speaker is not able to provide uniform response and adequate output power over the entire AF range.
- A loudspeaker mechanism with a heavy and large diameter called woofer can reproduce low frequencies.
- A loudspeaker with a light and small diameter cone known as tweeter which performs much better at the high frequency audio frequency range.
- For proper functioning of a dual speaker system, it is necessary that the frequency range to be covered by the combination of speakers should be split into two ranges at a frequency called cross-over frequency.
- Hence woofers & tweeters are used with cross-over networks, for getting a uniform frequency response over the entire frequency range.

Diagrams **(2 Mark)**



Explanation **(1 Mark)**

When a multiway loudspeaker system is used to get flat frequency response for the entire range of audio frequencies, it is essential to have a crossover network to divide the incoming signal into separate frequency ranges for each speaker.

In the absence of crossover networks, the speakers will suffer overheating and the output will be distorted when full power at frequencies outside their range is fed to them. The overall efficiency will be much reduced in the absence of crossover networks.

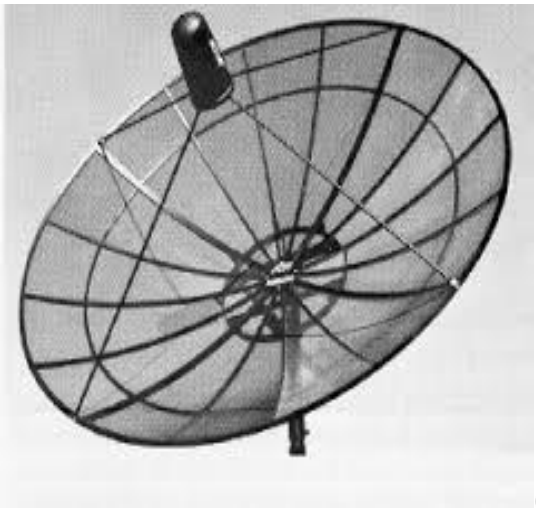
Crossover networks make use of the fact that the capacitive reactance *pi□decreases with increase in frequency [X = 1 / (2 *f*C)], and the 8*pi□inductive reactance increases with increase in frequency (X1= 2 *f* L). A basic crossover network is illustrated in fig.

The circuit consists of a low-pass LC filter across the woofer and a frequencies (16 Hz to 1000 Hz) to go to the woofer. The series reactance of L and shunt reactance of C for high audio frequencies prevents these frequencies from going to the woofer.

The high-pass filter consisting of C in series and L in shunt allows the high audio frequencies to pass to the tweeter and blocks the low frequencies.

ii. Draw the neat sketch of Dish Antenna and list any four specifications of Dish Antenna.

Ans:- **Any Relevant Diagram to be considered** **(2 Marks)**



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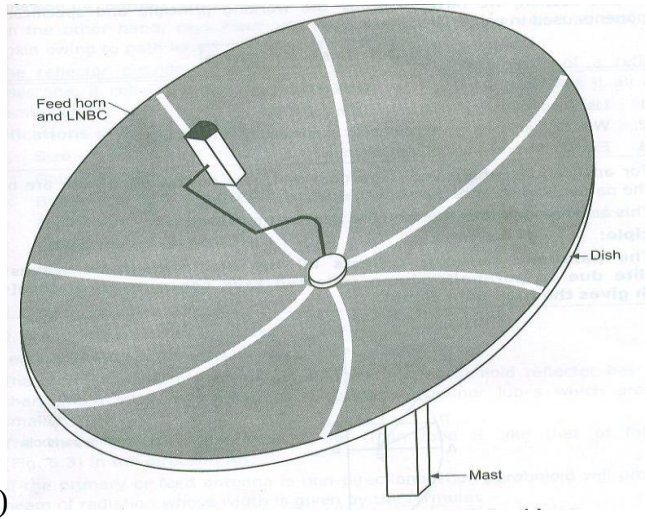


Specification of Dish Antenna (Any four) **(2 marks)**

1. Size-8 feet.
2. Gain-36 dB.
3. Band-C-(3.7 to 4.2 GHz downlink frequency).
4. Look angle-360 degree rotation in azimuth.18to90 degree rotation in elevation.
5. Offset angle-24.62 limit.
6. Focal length–90cm.
7. Elevation angle range=17 to 90 limit
8. Azimuth angle =0 to 360 degree
9. Aperture efficiency=75%

iii) . Define the following terms with respect to TV system.

1. Hue
2. Saturation
3. Chrominance Signal
4. Brightness

Ans.

1. Hue **(1 Mark)**

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

2. Saturation **(1 Mark)**

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

3. Chrominance Signal **(1 Mark)**

The combination of hue and saturation is together called as Chrominance Signal. In colour TV 4.43 MHz colour signal is chrominance signal which has all the colour information.

4. Brightness: **(1 Mark)**

Brightness or luminance is the amount of light intensity or the total amount of light energy that is received by the eye irrespective of the colour of light. In monochrome TV, better lighted parts have more luminance than dark areas and different colours have shades of luminance.

iv. List the types of drive motors used in TV system.

Note: Question is wrong. List the types of drive motors used in CD system.

Ans. **Types of driving motors used in CD player (4 Marks)**

1. Tray or loading motor
2. Disc, spindle or turn able motor
3. Slid, feed or sled motor

Q.1b Attempt any ONE of the following **(6 Marks)**

1. Why negative modulation is used in TV system instead of positive modulation. Justify your answer with respect to following points:

1) Effect of noise on picture signal
2) Effect of noise on synchronization
3) Peak power available

Ans.

1) Effect of noise on picture signal **(2 Marks)**

If noise spikes are present in video signal they extend into black level. So, if noise spikes are produced on the screen they appear as black dots, which are less annoying to human eye than that of white dots if positive modulation is used.

2) Effect of noise on synchronization **(2 Marks)**

The synchronization pulses are affected by noise. There will be loss of horizontal or vertical synchronization which results in diagonal or vertical rolling of picture.

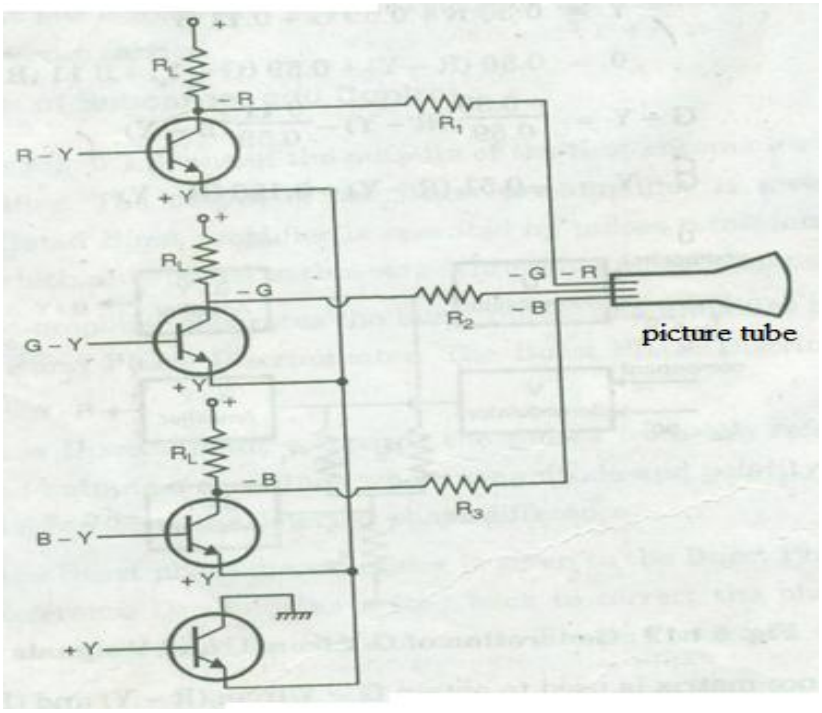
3) Peak power available **(2 Marks)**

In negative modulation black level is at maximum amplitude, so output power in transmitter is more.

2. Draw the circuit diagram of RGB drive amplifier and explain its working.

Ans. **(Circuit Diagram -3 Marks, Explanation- 3 Marks)**

RGB drive amplifier **(3 Marks)**



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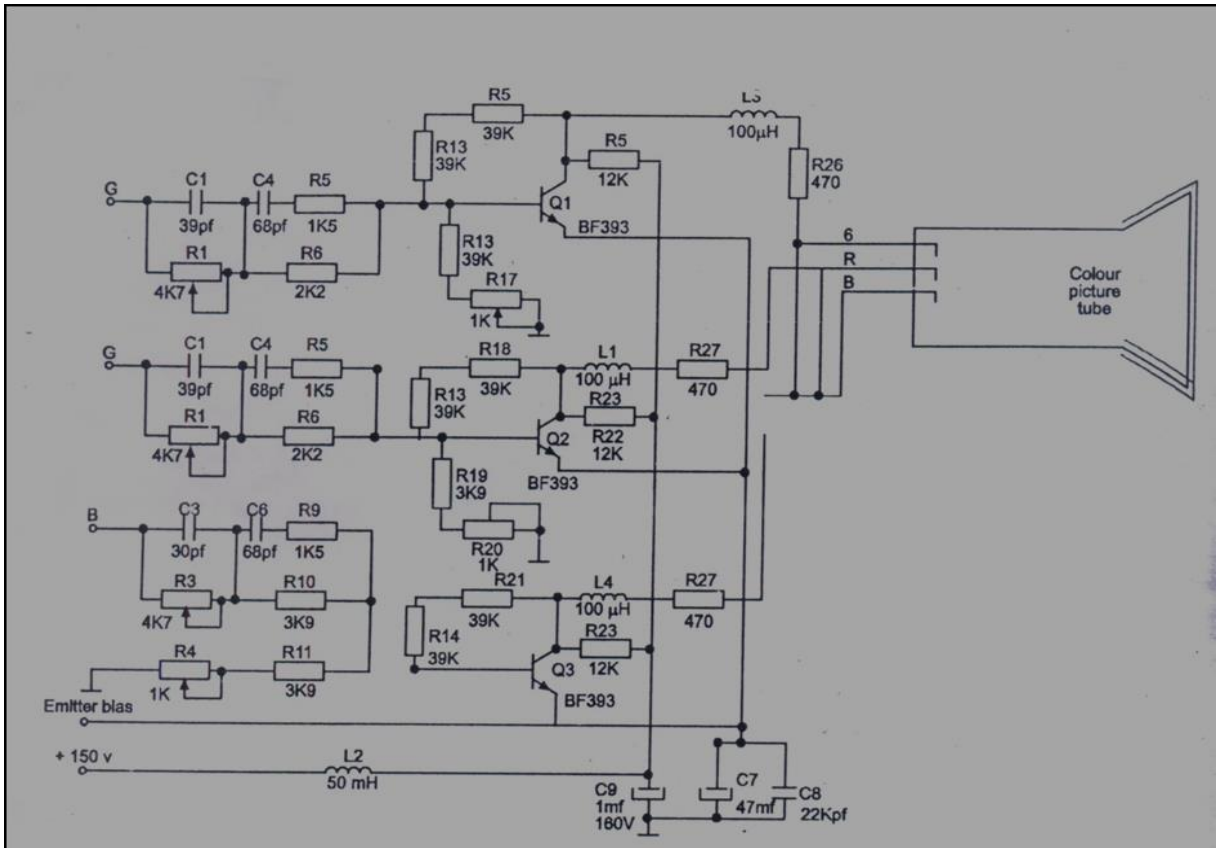


Circuit Diagram of RGB drive amplifier

Explanation **(3 Marks)**

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

R15 and R12 provide negative feedback to improve dc stability.L3 in the collector load used to extend bandwidth.C1 at input to amplifier is to improve step response.

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

Q.2 Attempt any FOUR of the following **(16 Marks)**

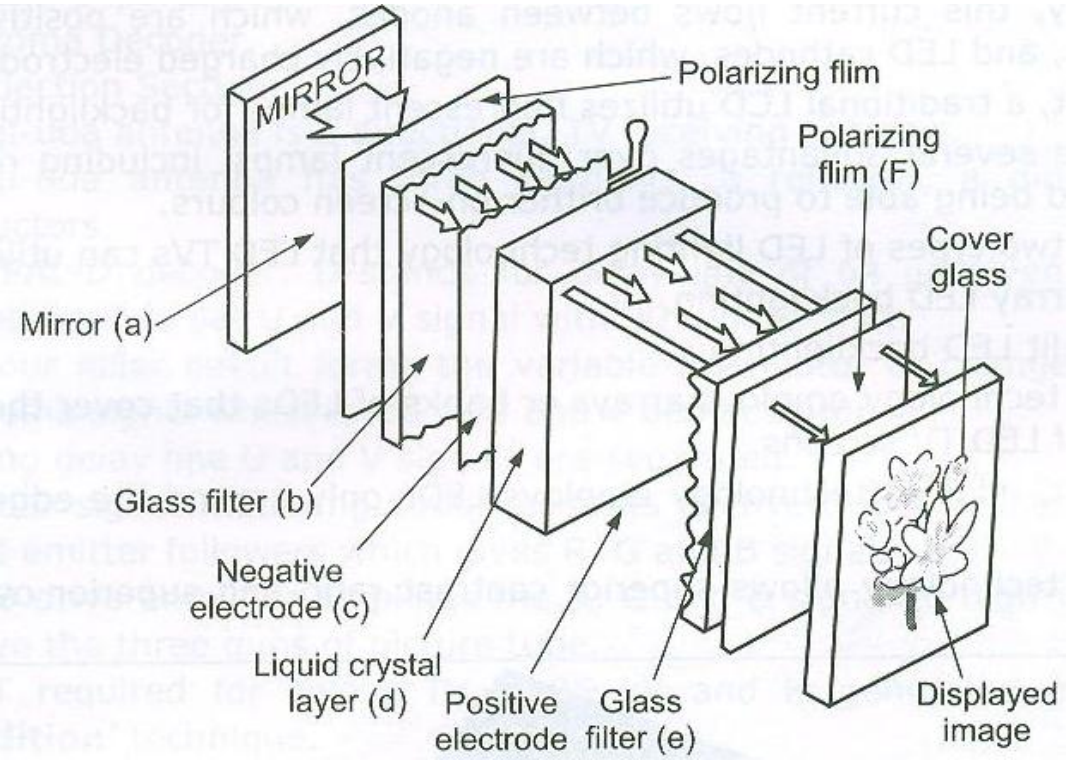
a) State the working principle and working of LCD TV with appropriate diagram.

Ans.

Working Principle **(1 Mark)**

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

Diagram **(2 Marks)**



Working **(1 Mark)**

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

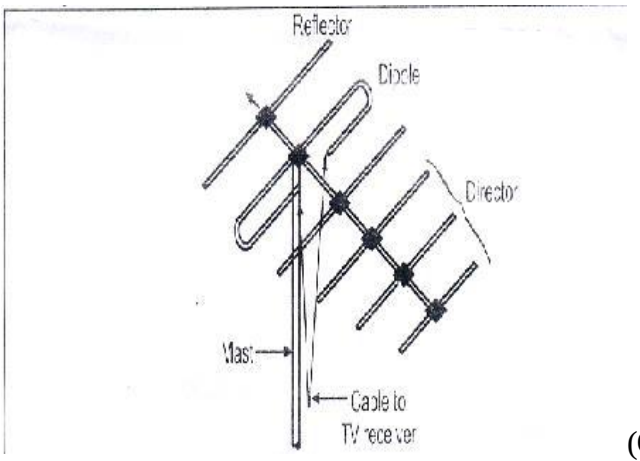
b) Compare additive colour mixing with subtractive colour mixing with respect to any four points.

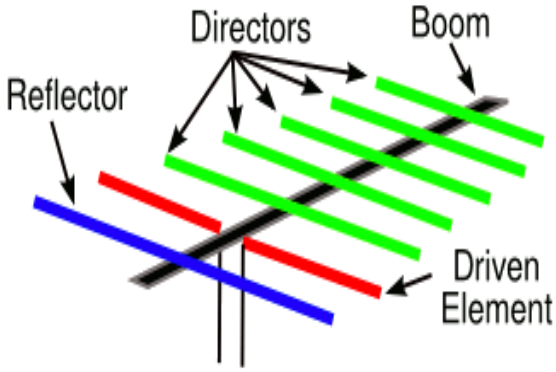
Ans. **(Four points)** **(4 Marks)**

Sr. No	Additive Mixing	Subtractive Mixing
1	Additive mixing of three primary colours red, green and blue with proper proportions can create any colour.	In subtracting mixing reflecting properties of pigments are used which absorb all wavelengths but for their characteristics colour wavelengths.
2	Different colours are created by mixing pure colours hence used in TV.	Different colours created by subtracting parts from white so not suitable for TV.
3	For example, Red +Blue=Magenta Red +Green =Yellow Green+Blue=Cyan	For example, White – Green =Magenta White – Blue =Yellow White – Red =Cyan
4	Additives primaries are Red, Green, and Blue.	Subtractive primaries are Magenta, Yellow, Cyan.

c) Draw sketch showing constructional details of Yagi -Uda antenna.

Ans. (Any one Relevant diagram – 4 Marks)





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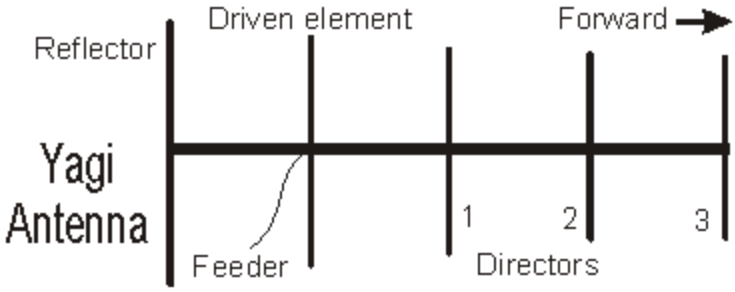
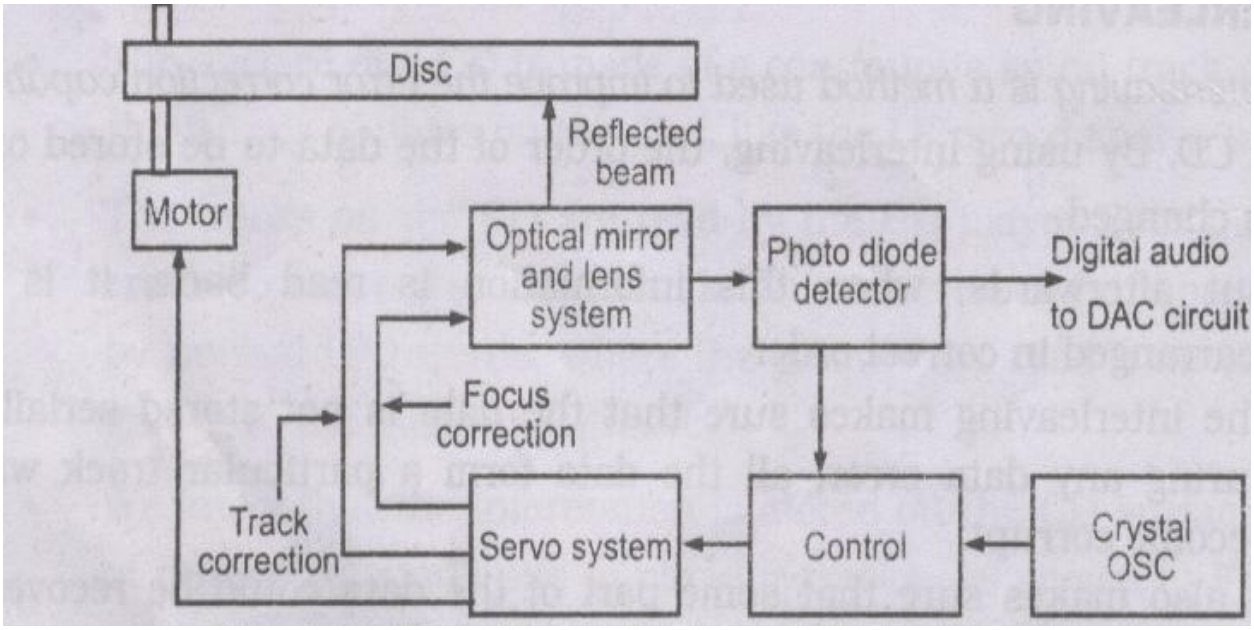


d) Explain data detection technique used in CD player with the help of neat sketch.

Ans. **Block diagram of detection or decoding circuit** **(2 Marks)**



Explanation **(2 Marks)**

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

Figure above shows the block diagram of data detection technique in CD player

- Control signals allow any combination of tracks to be played in any sequence with the help of a keyboard. Also the display of next is provided to monitor the music being played.
- Clock signal is obtained from the disc itself. It is compared with a crystal oscillator signal. Any discrepancy results in generation of correction signal which is applied to the servo system.
- As it is a very high fidelity system, it is incorporated stereo sound. Stereo signals are multiplexed before modulation of the laser beam. After detection, these signals are demultiplexed to give to separate channels of stereo systems.
- Scanning of the tracks by laser beam is done from the center proceeding towards the edge. For this purpose the disc is rotated and the laser is moved from the center to the edge.
- Scanning speed is about 1.2 m/s. Total track length is 6km. This gives playing time of 60 mins plus about 20 min time for error correction.
- Frequency response of a compact disc is from 20 Hz to 20 KHz.
- During decoding, the digital data on the disc surface is read by the decoding circuit and is converted into the analog audio signals required to drive the speaker and to regenerate the stored music.

e) Describe NHK MUSK system for HDTV.

Note: Spelling mistake in Question. Its MUSE not MUSK

Ans **Explanation** **(2 Marks)**

MUSE stands for Multiple Sub-Nyquist Sampling Encoding and is an HDTV bandwidth compression scheme developed by NHK.

It uses fundamental concepts for performance exchange in the spatio – temporal (transitory transformation) domain along with motion compensation to reduce the transmission bandwidth down to near about 10MHz.

The processed HDTV signal can be then transmitted using a single BDS channel.

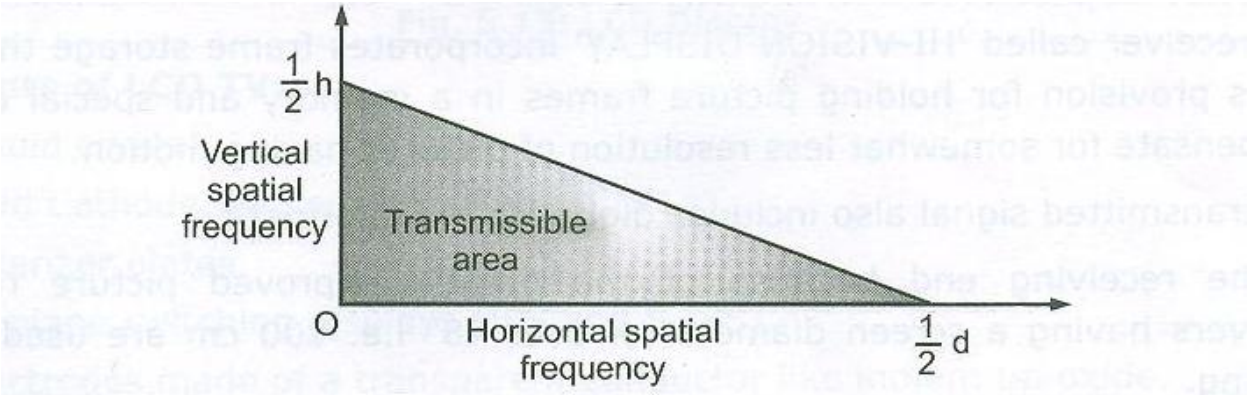
Temporal Interpolation

- In MUSE the luminance and colour information are sent by time multiplexed components (TMC)
- The colour information is sent sequentially with a time compression of four.
- The TMC signal is bandwidth reduced means of 3 – dimensional offset sub – sampling pattern over a four – field sequence.
- The stationary areas of the picture are reconstructed by temporal interpolation of samples from four fields.

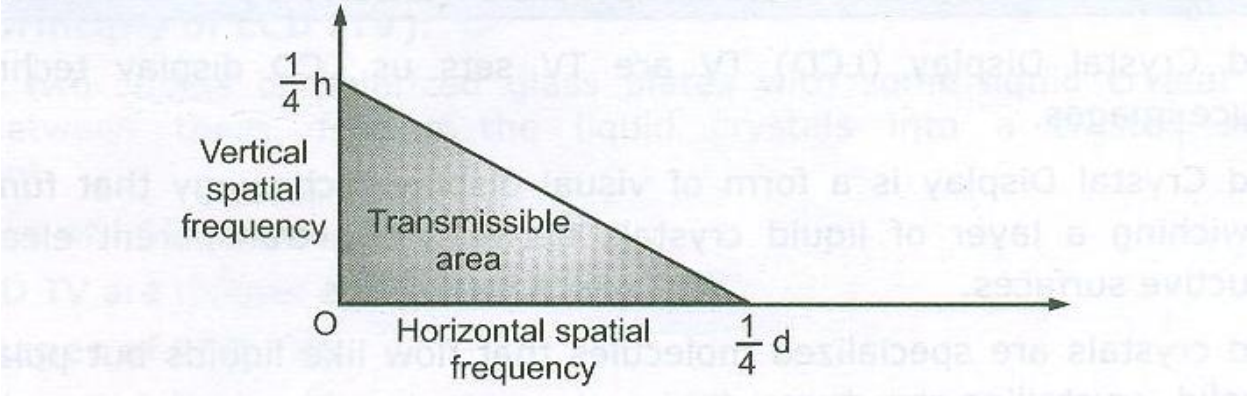
Spatial Interpolation

- For a moving picture area the final picture is reconstructed by spatial interpolation using samples from a single field. Hence moving potions of the picture are reproduced with one-quarter the spatial resolution of the stationary areas.
- The spatial frequency response for both stationary and moving areas of the picture is shown in figure below.
- The lack of resolution during movements of the entire scene as in case of camera panning, zooming or tilting is prevented by introducing spatial motion compression technique.
- A vector representing the motion of the scene is calculated for each filed at the encoder. This signal is multiplexed in the vertical blanking interval and transmitted to the receiver.
- In decoder, the read – out addresses of picture elements (pixels) from previous fields are shifted according to the information provided by the motion vector so that the data can be processed in still – picture mode.
- These two modes of interpolation, the inter – frame processing for stationary pictures and infra field averaging for moving portions of the picture are switched by detecting the moving areas at the decoder.
- Audio transmission is done by 4 – phase DPSK which is multiplexed with the processed video signal in the vertical blanking interval after frequency modulation of the transmission carrier by the video signal.

Diagram **(2 Marks)**



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



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

f) Compare mono amplifier system with stereo amplifier system

Ans. **(Any four correct points)** **(4 marks)**

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

3 Attempt any four of the following **(16 marks)**

a) Draw block diagram of DTH system and explain its operation.

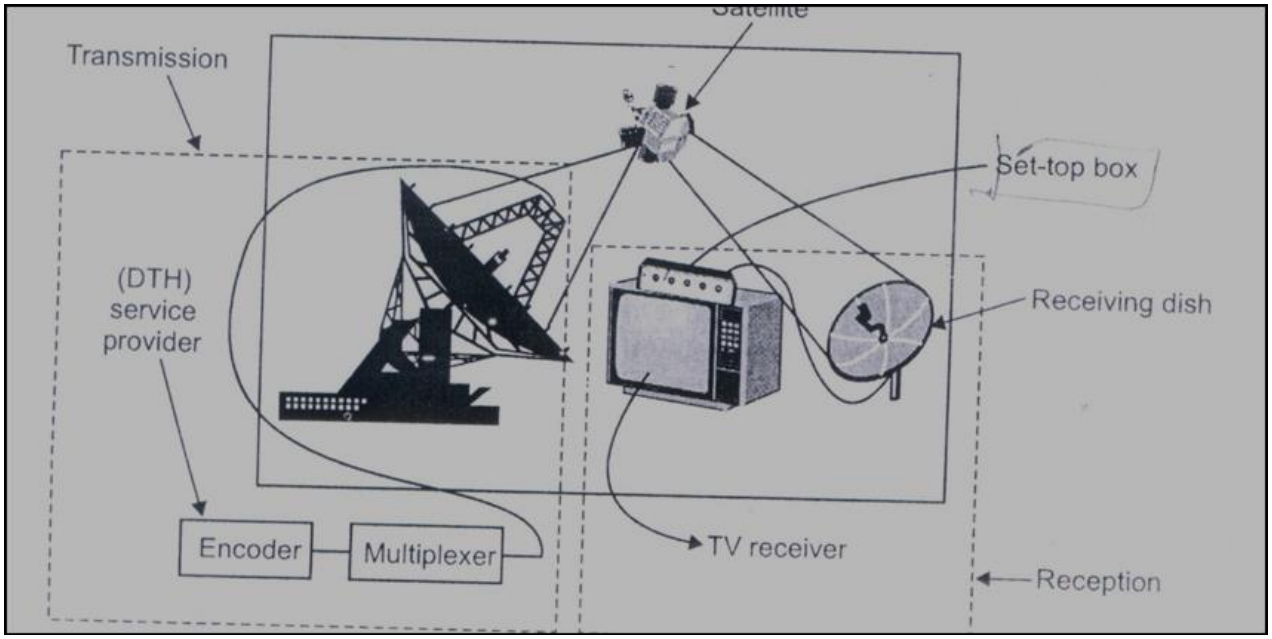
Ans. **(2 Marks)**

DTH service is the one in which a large number of channels are digitally compressed, encrypted and beamed from very high power satellites. The programs can be directly received at homes.

This mode of reception facilitates the use of small receiving dish antennas of 45 to 60 cm diameter installed at convenient location in individual buildings without needing elaborate foundation or space etc.

Also, DTH transmission eliminates local cable operator completely since an individual user is directly connected to the service providers. DTH is contrast to cable TV lends itself to easy monitoring and control. As mentioned above, all the encoded transmission signals are digital, thus providing higher resolution picture quality and better audio than traditional an analog signals. A DTH network consists of broadcasting center satellites, encoders, multiplexers, modulators and DTH receivers.

Block diagram of DTH **(2 marks)**



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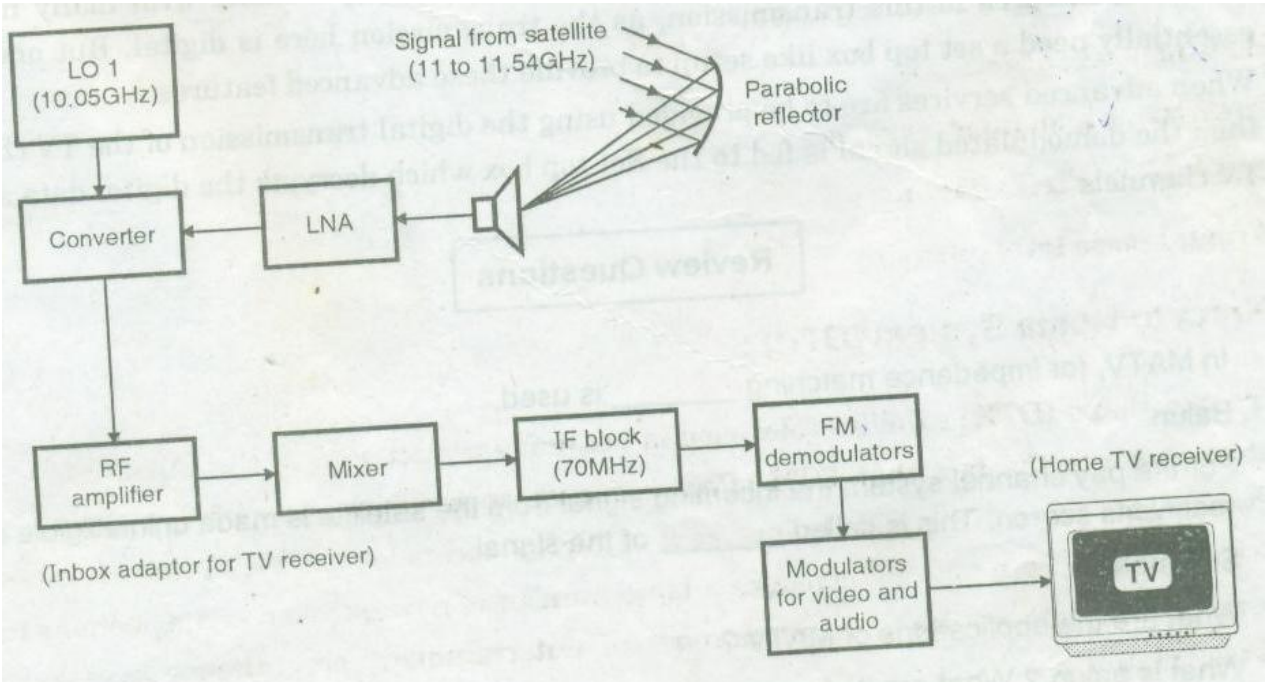


A DTH service provider has to lease Ku-band transponders from satellite.

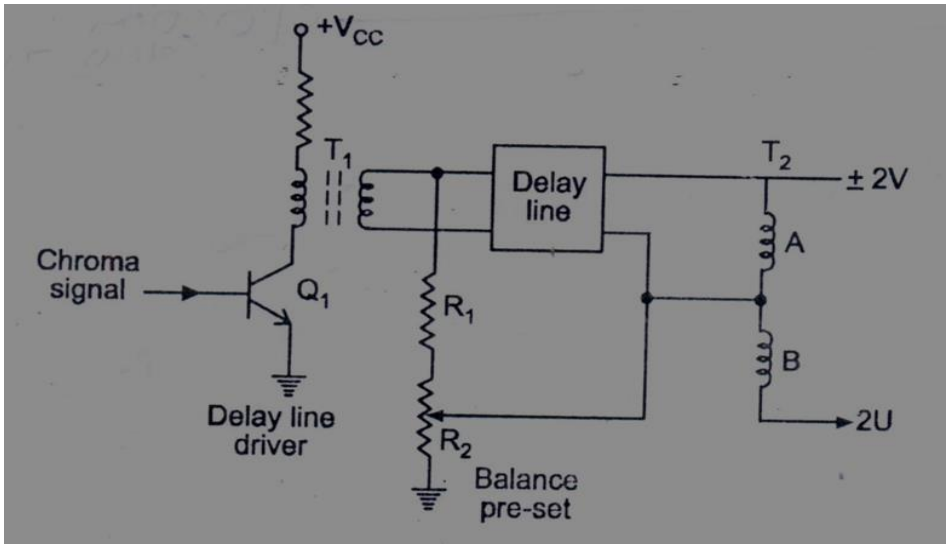
The encoder converts the audio, video and data signals into the digital format and the multiplexers mixes these signals. At the user end, there will be a small dish antenna and set top box to decode and view numerous channels.

On the user's end, receiving dishes can be as small as 45 cm in diameter. DTH is an encrypted transmission that travels to the consumer at his end through the small dish antenna.

A set top box, unlike the regular cable connection, decodes the encrypted transmission.

b) With the help of suitable diagram, explain how U and V signals are separated in colour TV.

Ans: (Diagram 2 marks, explanation 2 marks)



Working:

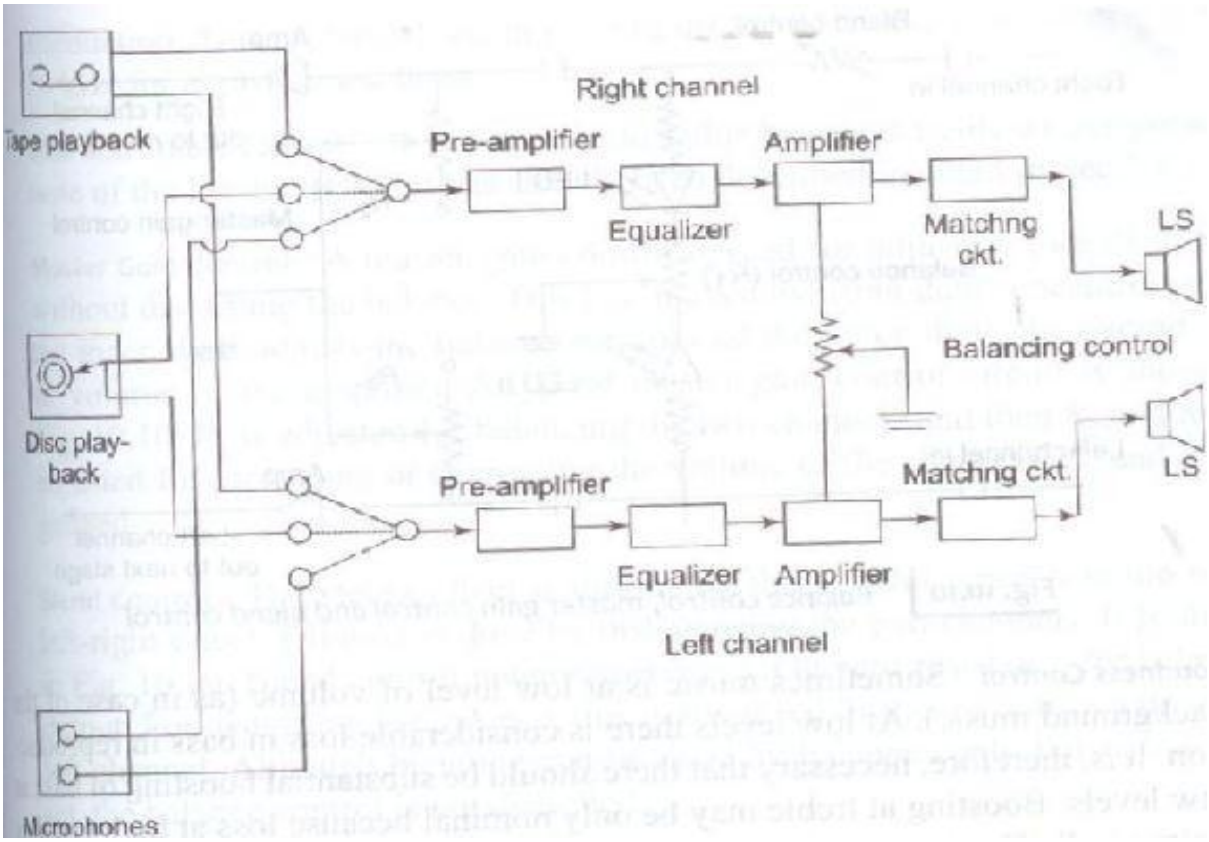
Chroma signal is applied to Q1. Chroma signal is applied to delay line through transformer T1.This signal after delay line appears across A winding. Direct signal is fed to center top of T2transformer. Voltage induced into winding A and B is equal in magnitude but opposite in phase due to signal from delay line. Whereas voltage induced into winding A and winding B is equal in magnitude and same phase. This means that direct and delayed signals have same phase in one winding but are of opposite phase in second winding. Thus results in separation of U and V signal.

c) Draw block diagram of Hi-fi audio amplifier. State any four characteristics of Hi-fi system.

Ans. Characteristics of HI-FI amplifier **(any four points)** **(2 Marks)**

1. Signal to noise ratio should be better than 50dB.
2. Frequency response should be flat within +-1dB.
3. Non-linear distortion should not be more than 1%.
4. The system should possess dynamic range of atleast 8dB.
5. Stereophonic effect should be provided.
6. Environmental conditions should be such as to eliminate the external noise in listening room.

Block diagram: **(2 marks)**



d) List any four advantages of fluorescent display system used in CD player.

Ans. **(any four points-1- mark each)**

- In addition to ten numerals, the display can be used to show letters including punctuation.
- It gives hexadecimal encoding for display the digits 0 to F.
- To remove the ambiguity letter „B" is small „b" and number „8" is in 7 segment display, otherwise both would have looked same.
- It can give short message giving status information in CD player like "no disc" or "error" etc.
- The fluorescent numbers and messages can be seen in the dark also.

e) State any eight CCIR-B standards for colour signal transmission and reception.

Ans. **(any eight standards- ½ mark each)**

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

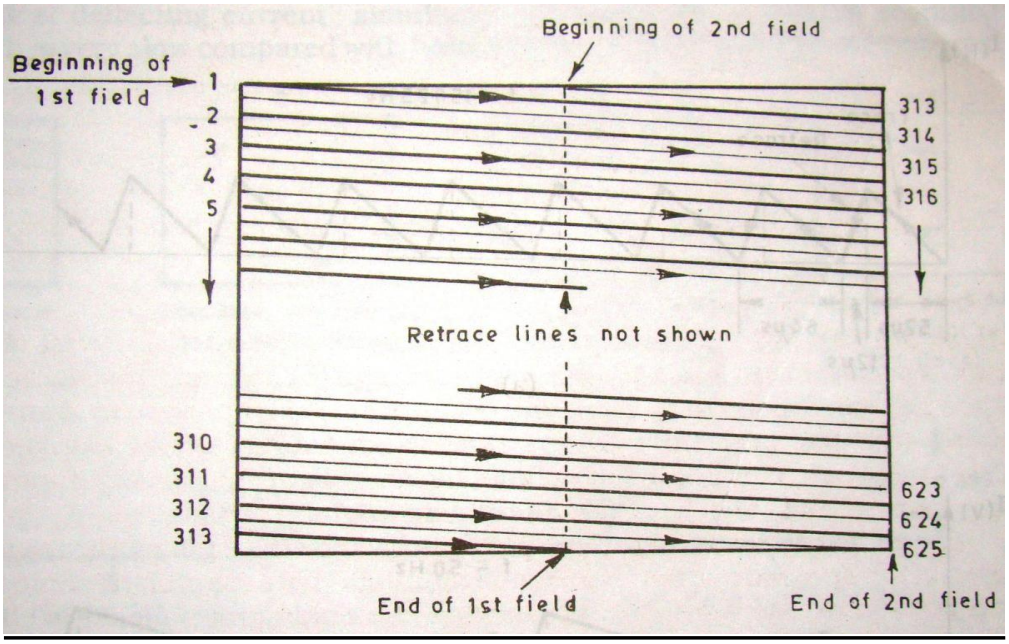
4.a) Attempt any three of the following: (12 marks)

i) What is meant by flicker? How flicker is eliminated by interlaced scanning? Explain.

Flicker: (1 Mark)

Although 25 to 30 frames per second are sufficient to give continuity of motion in a movie scene, the dark interruptions between bright pictures become visible as flicker (because persistence of vision increases as brightness decreases) Hence, a frame is scanned twice, using the interlaced scanning technique. In this system, the scanning lines of one sequence fall in between the lines of the previous sequence. This gives 50 interruptions per second and eliminates flicker.

Diagram: (1 Mark)

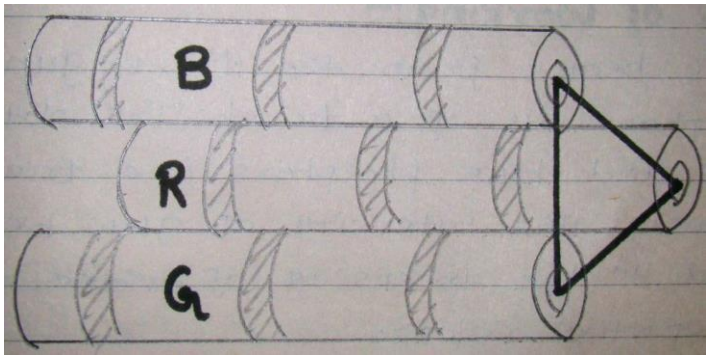


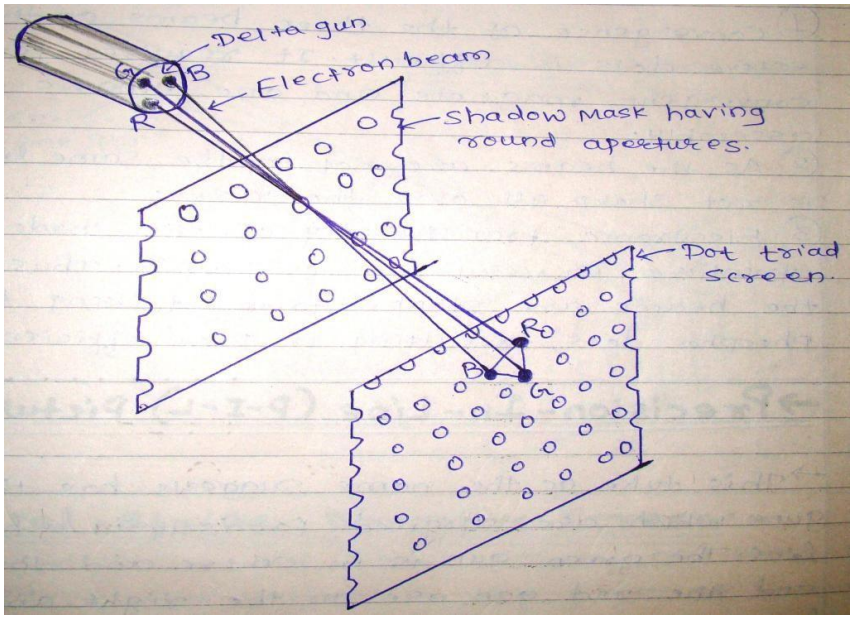
<u>Interlaced scanning</u>: (2 Marks)

- In T.V. pictures an effective rate of 50 vertical scans per second is utilized to reduce flicker.
- Total numbers of lines are divided in to two groups called fields (even and odd)
- As shown in figure above the first sequence of scanning starts from left most ends on middle on last line.
- The vertical retrace is shown by dotted line deflects the electron beam from bottom to top shown by dotted lines which takes 1.280ms (equal to 20 scanning lines) are blanked in retrace.
- The second sequence of scanning stars from this middle point and ends finally at the rightmost point bottom after completing 605^{th} line.

ii) State principle and explain working of Delta gun picture tube with the help of neat sketch.

Ans. (Working Principle - 2 Marks, Diagram 2Marks)





Working principle:

Electron beam from the three guns strikes three phosphor dots of s triad. The dots of red, green and blue phosphor in a triad glow simultaneously, the intensity of glow being proportional to the intensity of video signal of respective colours.

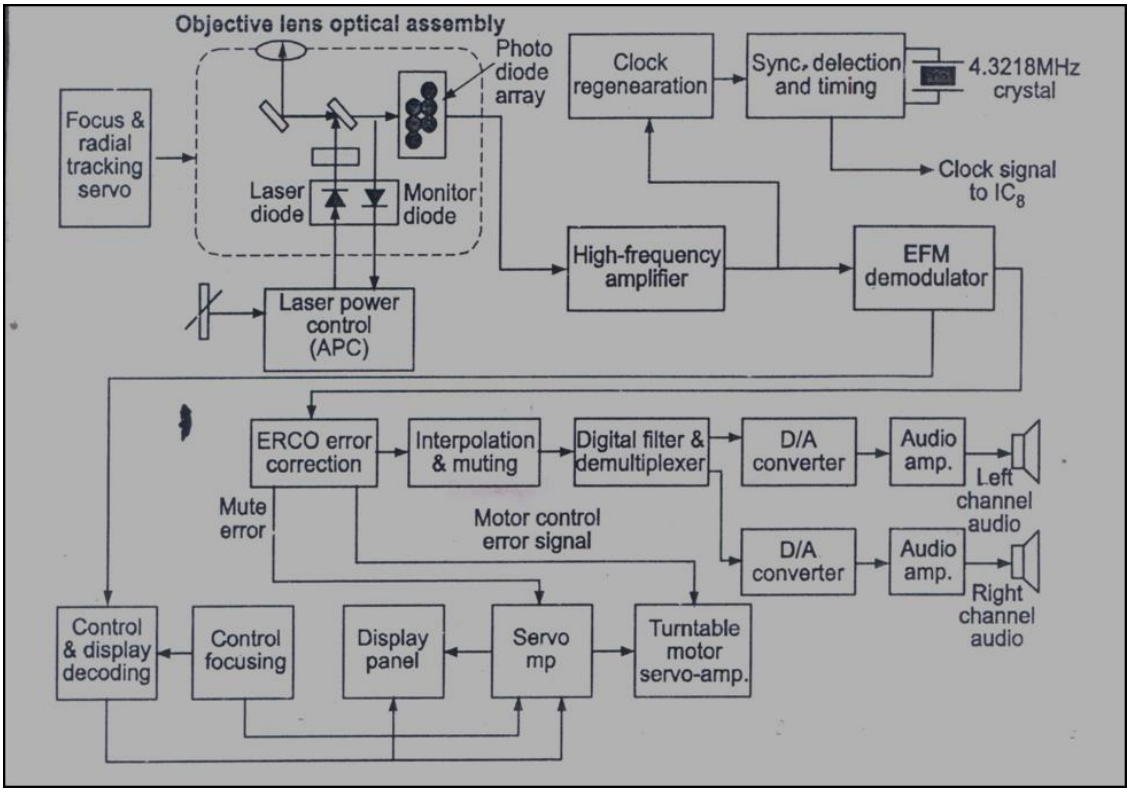
The eye adds the three colours emitted by the phosphor dots at a time and perceives the resultant colour of the concerned pixel as in the original picture.

Triads glow one after other in quick succession due to deflection of the beams and hence the whole picture is reproduces in its original colours.

The ratio of electrons passing through the holes to those reaching the shadow mask is only about 20%. The remaining 80% of the total beam current energy is dissipated as a heat loss in the shadow mask.

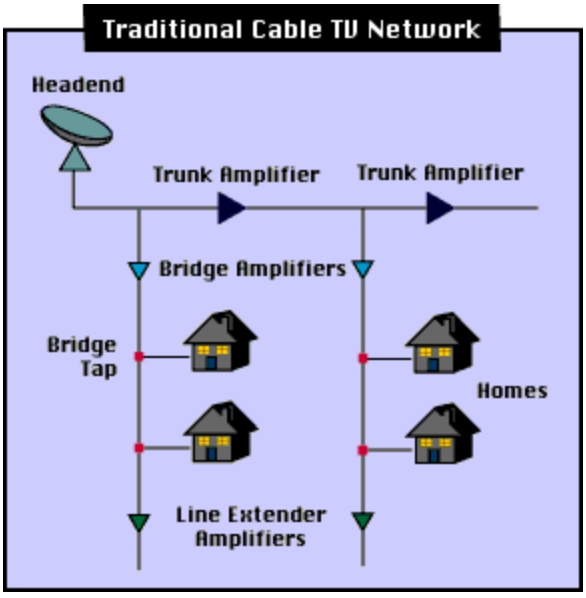
iii) Draw the block diagram of CD player.

Ans. **(4 Marks)**



iv) Draw typical cable TV network plan and state the function of different types of amplifiers used in cable TV system.

Ans. **(1Mark Diagram)**



(Or any other relevant diagram should be considered)

Trunk amplifier: **(1 Mark)**

Trunk amplifiers with equalizers are used at regular intervals in the trunk system to overcome the losses in the cable, which increases towards the high end of the spectrum. These trunk line repeaters providing a gain of about 20 dB, compensate the corresponding loss of a cable run of about 600m, depending on the type of cable used and maintain the signal level 1 to 3 mV.

Bridging amplifier: **(1 Mark)**

Bridging amplifier is used for feeding a branch lines from the main trunk, distributing the signal to subscriber drops. A bridge amplifier, sometimes used with trunk amplifier, providing a gain of about 20 to 40 dB, to feed the signals to the subscriber cables through directional couplers and signal splitters which provide isolation from reflections or interferences coming from subscriber set.

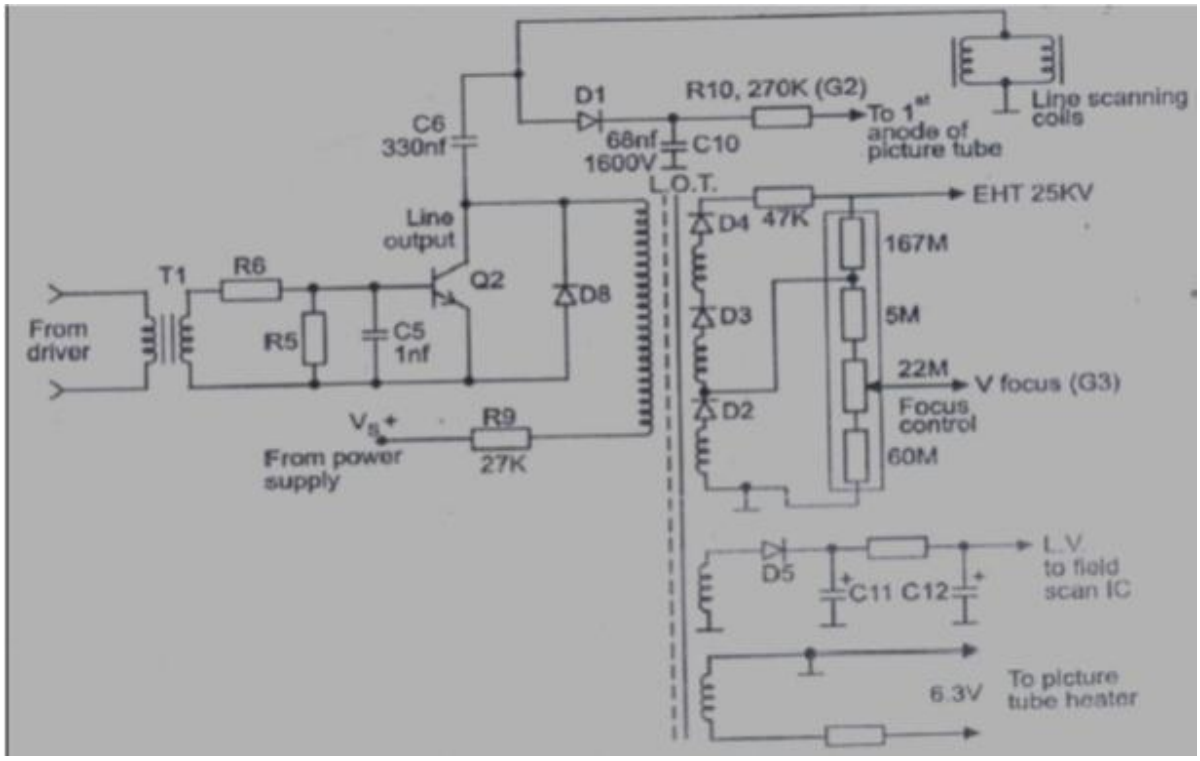
Line amplifier: **(1 Mark)**

Line amplifiers are inserted in the branch line to make for the cable losses that connects the distribution system. Typical gain is 20 to 40 dB

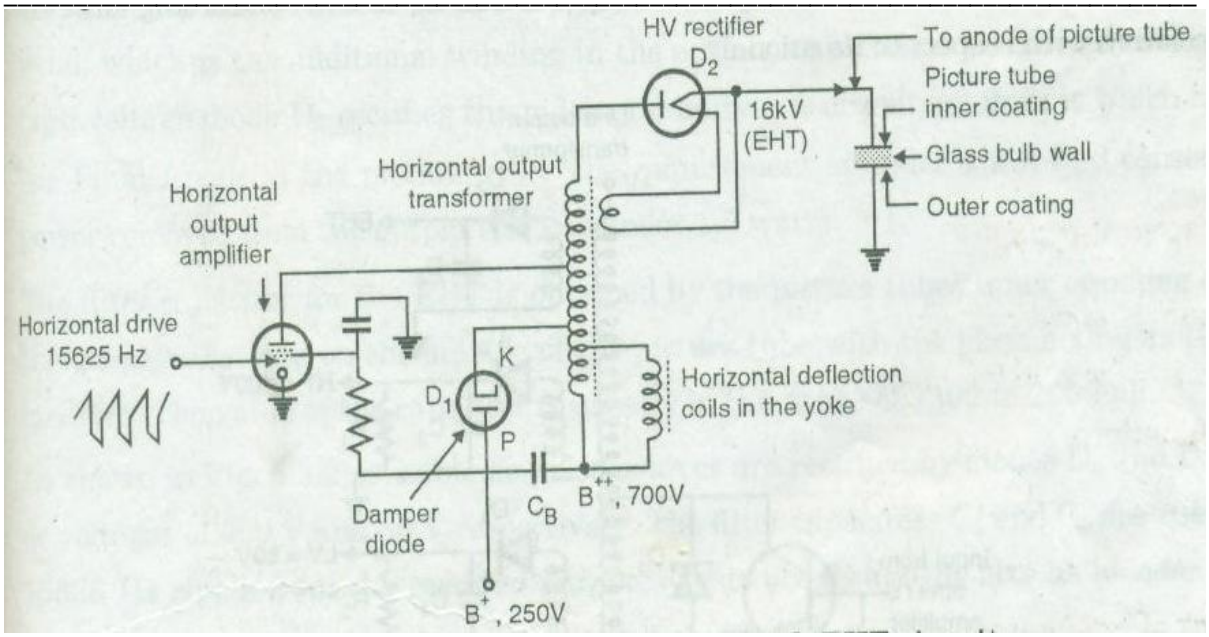
b) Attempt any one of the following: **(6 Marks)**

i) Draw circuit diagram showing how EHT supply is generated from line output stage in colour TV.

Ans. **(6 Marks)**



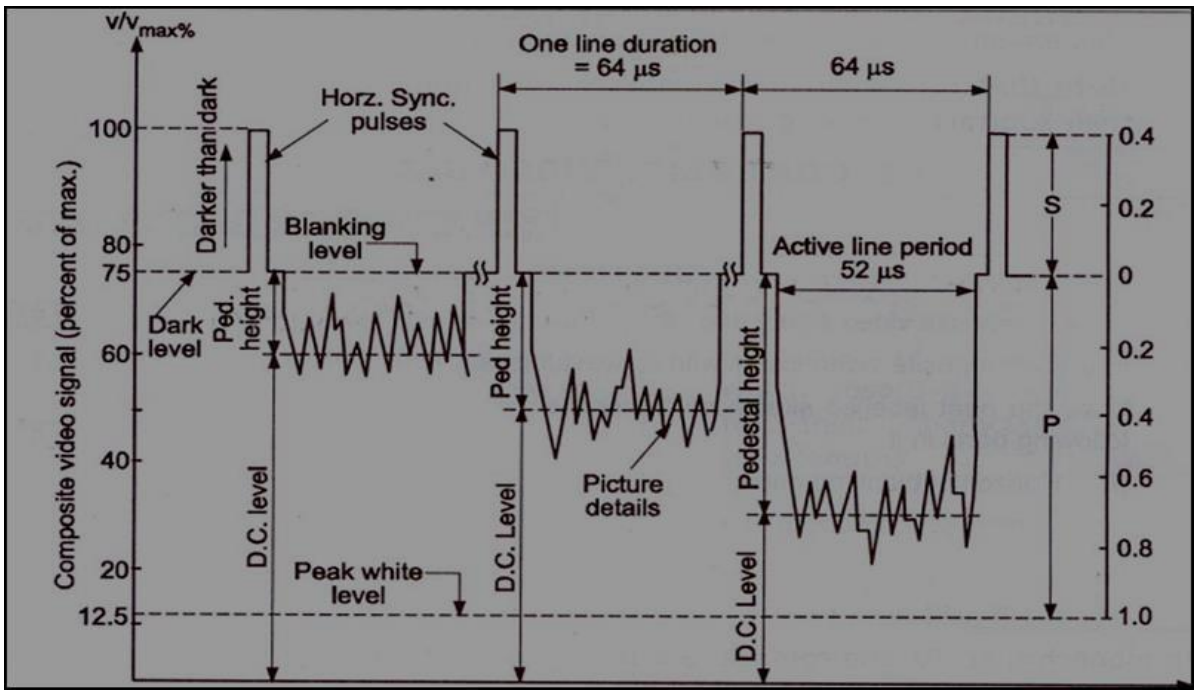
(OR)



ii) Draw composite video signal showing all details and explain the following terms :

1. DC level
2. Blanking level
3. whiter than white level
4. Pedestal height

Ans: **(Diagram 2 Marks)**



DC level: **(1 Mark)**

DC level corresponds to average brightness of the scene.

Blanking level: **(1 Mark)**

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

Whiter than white level: **(1 Mark)**

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

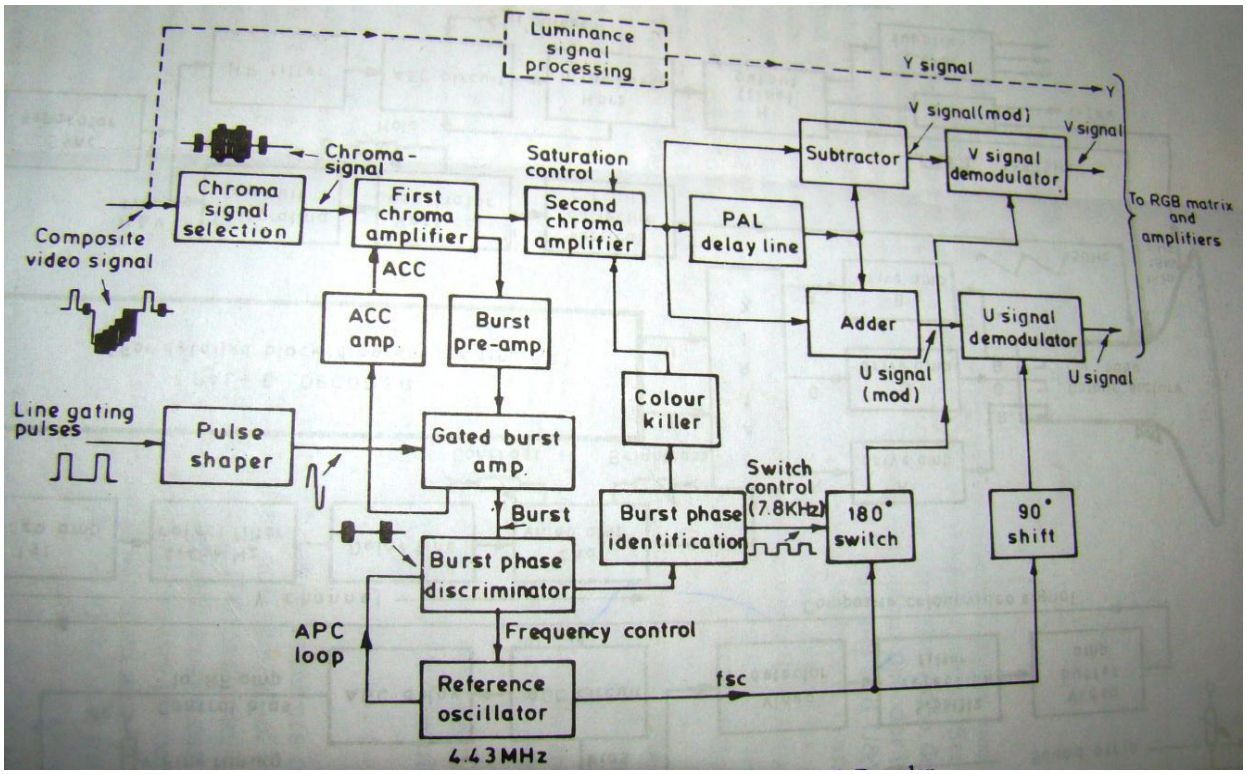
Pedestal height: **(1 Mark)**

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

Q5. Attempt any two of following: **(16 Marks)**

a) Draw the block diagram of PAL-D decoder and explain its working in detail.

Ans. **(Diagram-4 marks block wise explanation-4 marks)**



Explanation:

Chroma signal selection: Its function is to select chroma and colour burst signal from the incoming CCVS signal by chroma signal selection circuit. It essentially consist of band pass circuit whose centre frequency is chosen to be equal to that of chroma sub-carrier it self i.e.4.43MHz.

1st chroma amplifier: The chroma and burst signals are amplified by first chroma amplifier which is controlled by DC voltage developed by the Automatic Chroma Control (ACC) amplifier.

2nd chroma amplifier: The second chroma amplifier incorporates colour saturation control circuit. The output of colour killer also feeds into it.

PAL delay line (separation of U and V colour phasors): This network separated U and V signals with are then fed to respective demodulator.

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

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

Burst phase discriminator: It is sensitive to burst pulses and is designed to detect any differences which might exist between the phase of burst pulse and that of the reference oscillator. It produces at its output a dc voltage whose magnitude and polarity are proportional to the magnitude and direction of the detected phase difference.

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

180°switch: This switch is used to periodically invert the waveform fed to the v-signal demodulator.

Colour killer control: This is just a half wave rectifier which produces a steady dc potential from the succession of burst pulses. During black and white transmission the dc potential is absent and hence biases the 2nd chroma amplifier to cutoff state.

b) State importance of LNBC. Draw block diagram of LNBC and explain its working in detail.

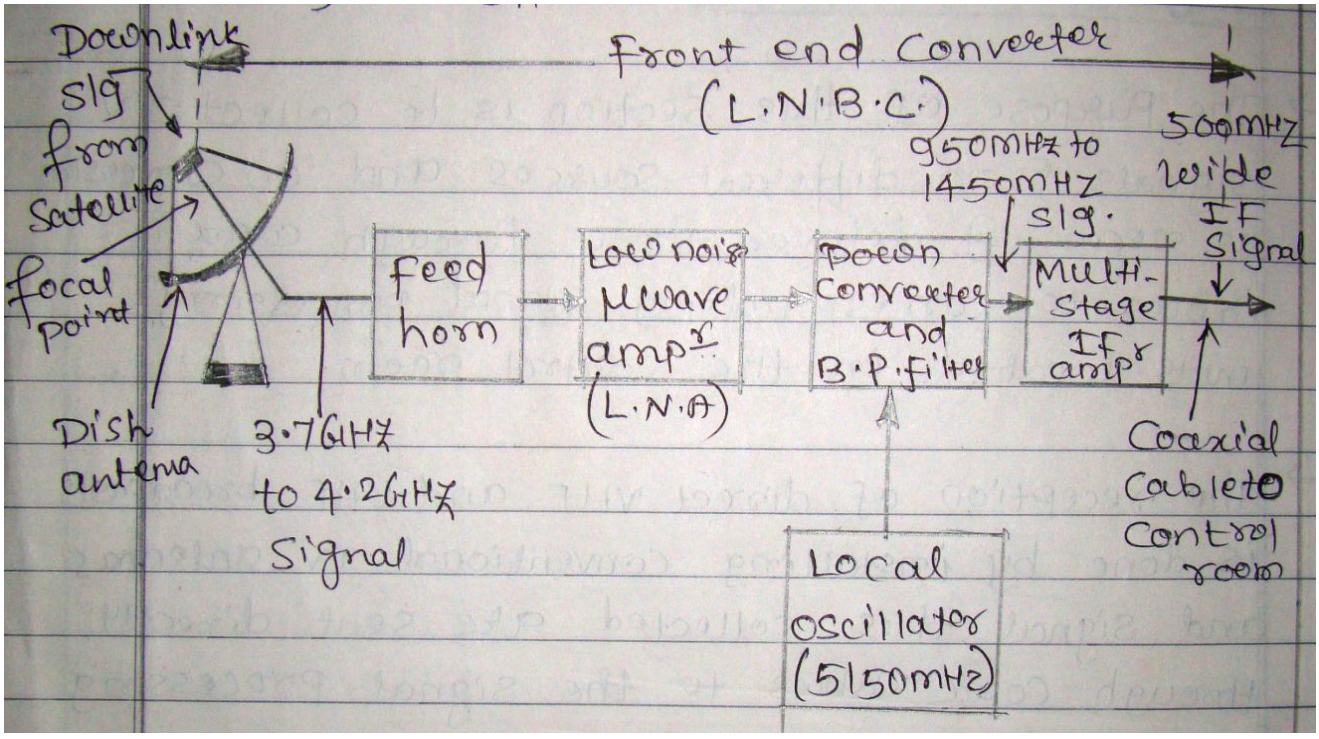
Ans.

Importance of LNBC: **(2 Marks)**

It is the device on the front of a satellite dish that receives the very low level microwave signal from the satellite, amplifies it, changes the signals to a lower frequency band and sends them down the cable to the indoor receiver.

This down conversion allows the signal to be carried to the indoor satellite TV receiver using relatively cheap coaxial cable; if the signal remained at its original microwave frequency it would require an expensive and impractical waveguide line.

Diagram **(4 Marks)**



Explanation **(2 Marks)**

Dish antenna and feed horn: A feed horn is actually a flared open waveguide section which is mounted at focal point and its function is to receive signals reflected towards it by the delivers these to the close by located unit called as Low Noise Block Convertor (LNBC).

Low Noise Amplifier (LNA): The CVS collected by the feed horn is fed to LNA which is specially designed to provide enough gain which maintains maximum possible S/N ratio.

Mixer (down convertors): Mixer translates the incoming microwave signals to a lower frequency range of 950-1450MHz. This is achieved by mixing local oscillator frequency of 5150 MHz at mixer and selecting only the difference from output.

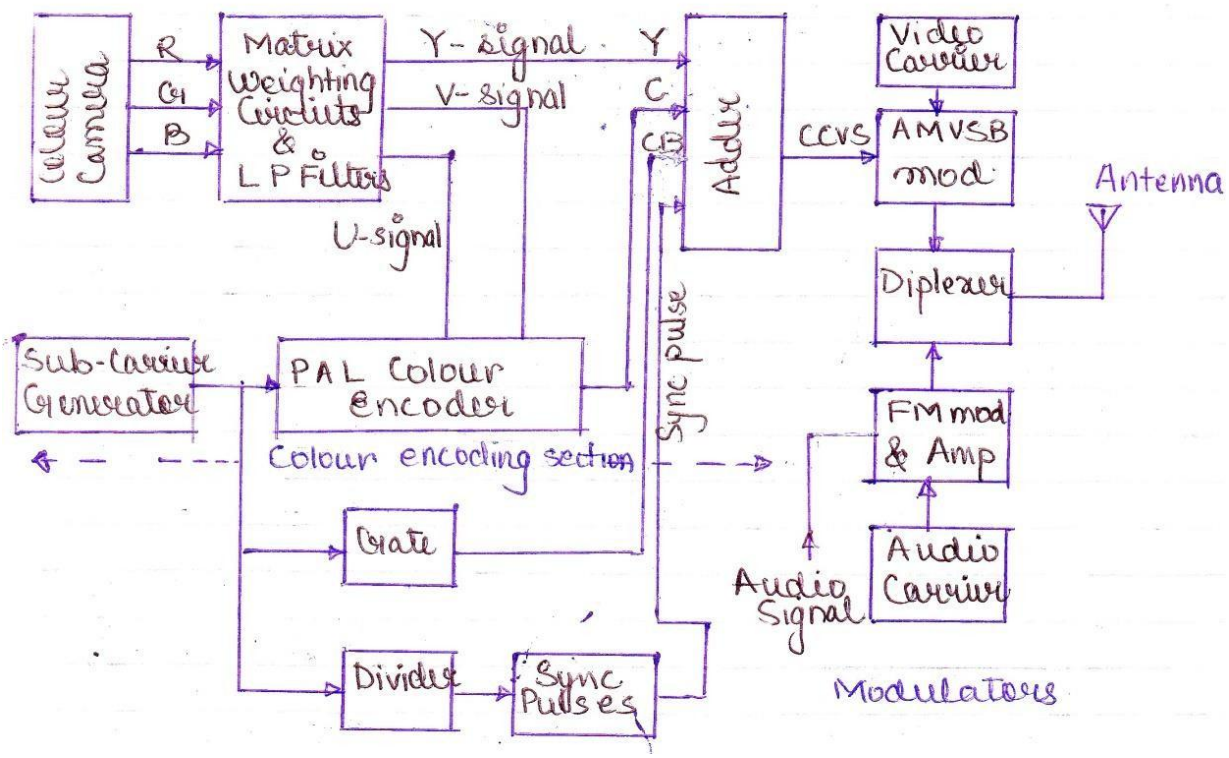
Band pass filter: A BPF at the output mixer separates the wanted IF signals from the other signals.

Multistage IF amplifier: It amplifies the down converted signals and then sent through high grade coaxial cable to the CATV.

c) Draw block diagram of colour TV transmitter (encoder) and explain its working in detail.

Ans.

Diagram **(4 Marks)**



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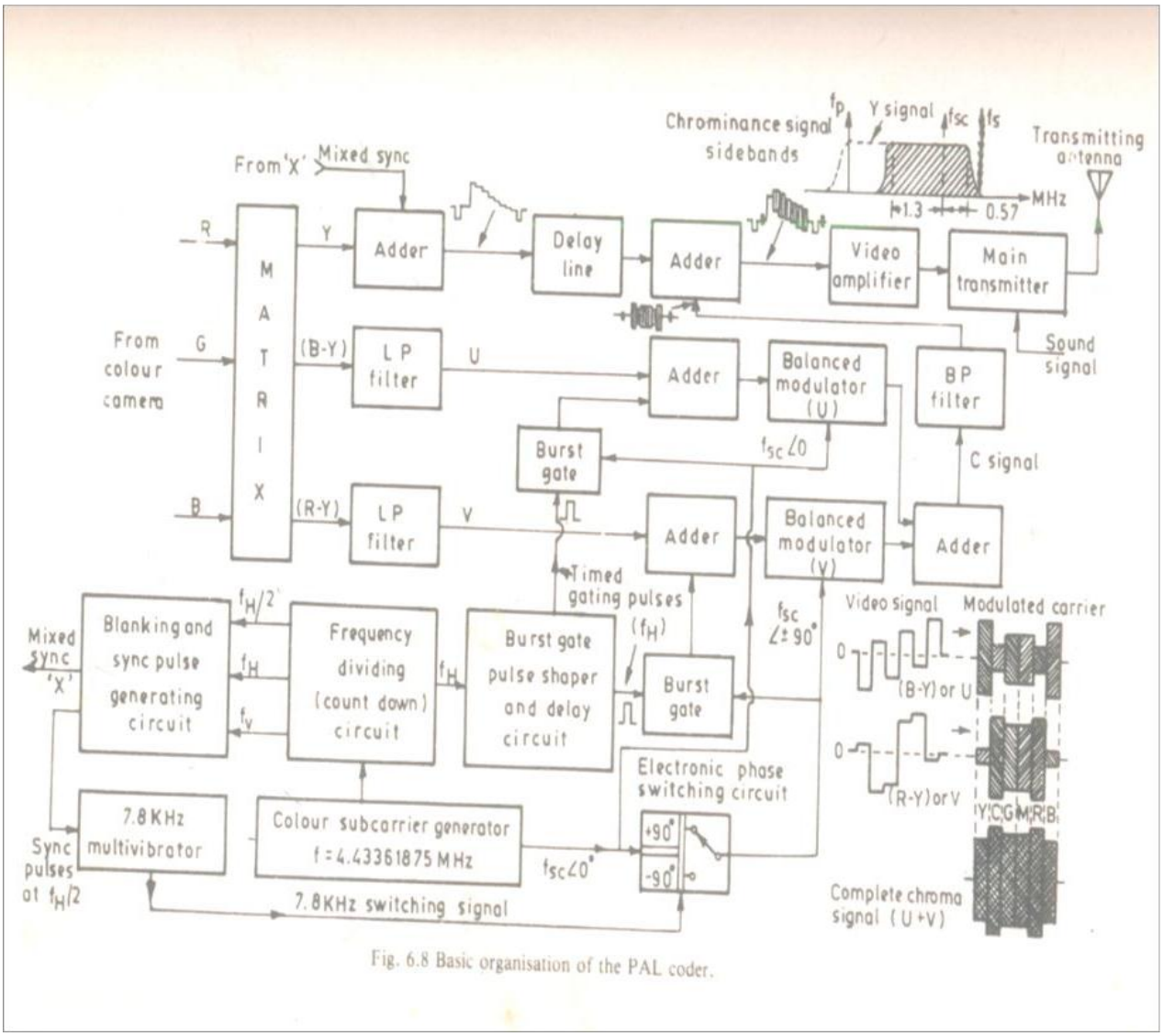


Fig. 6.8 Basic organisation of the PAL coder.

Explanation **(4 Marks)**

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

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

Colour camera tube produces R, G and B voltages pertaining to the intensity of red, green and blue colours respectively in pixels.

The luminance signal Y is obtained by a resistive matrix, using grass man's law. **Y=0.3R+0.59G+0.11B.**

For colour section Y is inverted colours R and B obtained from the colour camera tubes are added to it to get (R-Y) and (B-Y) colour difference signal.

These signals are weighted by two resistive matrix network which gives „U" and „V" signals as **U=0.493 (B-Y) & V=0.877(R-Y)**

2. PAL encoder:

PAL switch which operates electronically at 7812.5Hz with the help of bistable multivibrator and feeds the sub-carrier to balanced modulator with phase difference of +900 on one line and -900 on the next line.

The PAL encoder consists of a sub carrier generator and two balanced modulator with filters to produce modulated sub carrier signal. These signals are added vertically to give chroma signal (C).

Then chroma signal is mixed with Y signal along with sync. And blanking pulses to produce Colour Composite Video Signal (CCVS).

3. **Video and Audio modulators and transmitting antenna**:

CCVS amplitude modulates the main video carrier. It is followed by a sharp VSB filter to attenuate the LSB to give AMVSB signal for transmitter.

Audio signal modulates separate carrier. This modulation is FM type.

AMVSB video signal along with audio signal passes to the transmitting antenna through Diplexer Bridge which is a whetstones bridge.

Q6. Attempt any four of following: (16 Marks)

a) Define the term resolution with respect to TV system. Explain the term horizontal and vertical resolution in detail.

Ans.

Resolution: the scanning and reproduction of the finest details of the picture is known as resolution of TV system. **(1 Mark)**

Vertical Resolution (1 ½ Marks)

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

1. Vertical resolution is a function of scanning lines into which the picture is divided in the vertical plane.

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

3. Thus ,vertical resolution can be expressed as, Vr = Na*K

Vr = Vertical resolution

Na = Active number of lines K-kell factor or resolution factor

Horizontal Resolution: **(1 ½ Marks)**

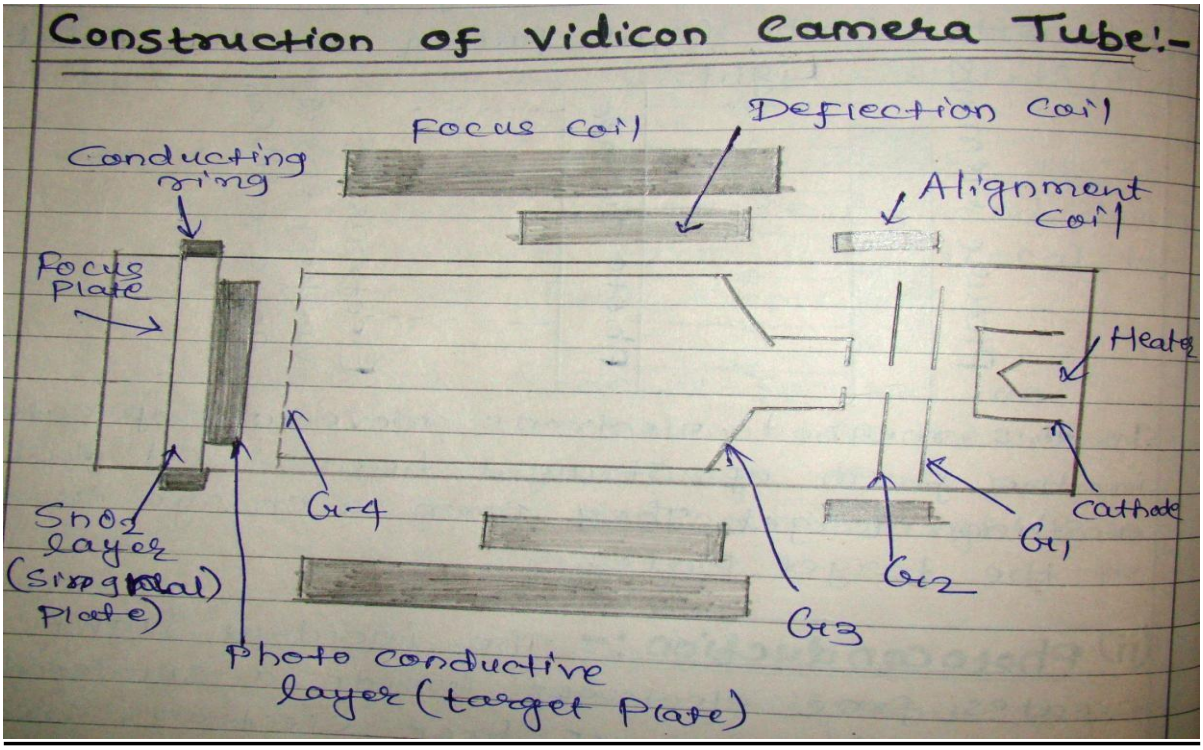
The ability of the scanning system to resolve the picture details in the horizontal direction is known as **horizontal resolution.**

1. While aiming at equal vertical and horizontal resolutions and assuming the same Kell factors the effective number of alternate black and white segments (N) that get scanned in one horizontal line are-

N = Na * Aspect Ratio *K

b) State principle and explain working of vidicon camera tube with the help of neat sketch.

Ans. **(diagram 2 Marks)**



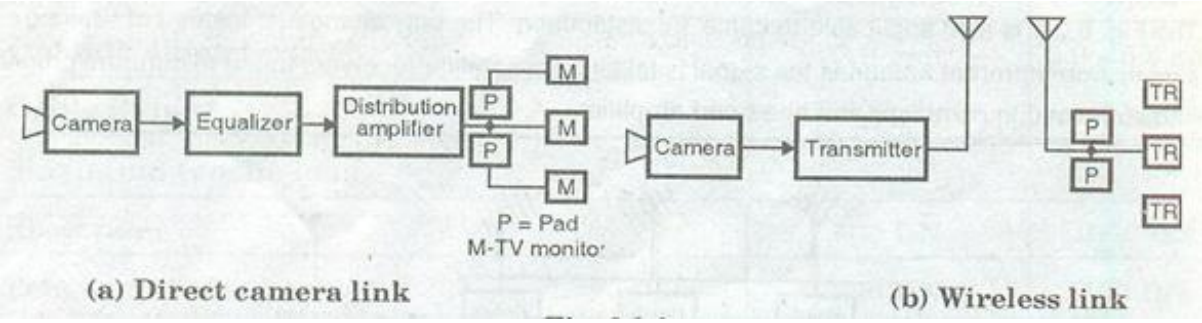
Working (2 Marks)

- The input light from scene passes through a lens system and is incident on the face plate made of optically flat glass.
- The light from the face plate falls on a target plate which has two layers. Facing face plate is a thin coating of tin oxide which is transparent to light and is a good conductor of electricity. This layer is called signal plate.
- The back from target plate (facing the electron gun) is coated with antimony trisulphide, a semiconductor.
- The target plate is scanned by a focused electron beam produced by an electron gin consisting of indirectly heated cathode.
- **A control grid (G-1)**

- **An accelerator grid (G-2) (300V)**
- **Focus grid(G-3) (260V)**
- **Grid (G-4) (400V)**
- **Deflection coils** deflects the electron beam horizontally and vertically.
- **Focus coil** sharpens beam.

c) Draw block diagram of closed circuit TV (CCTV) system and explain function of each block.

Ans: **Block diagram of CCTV system (2 Marks)**

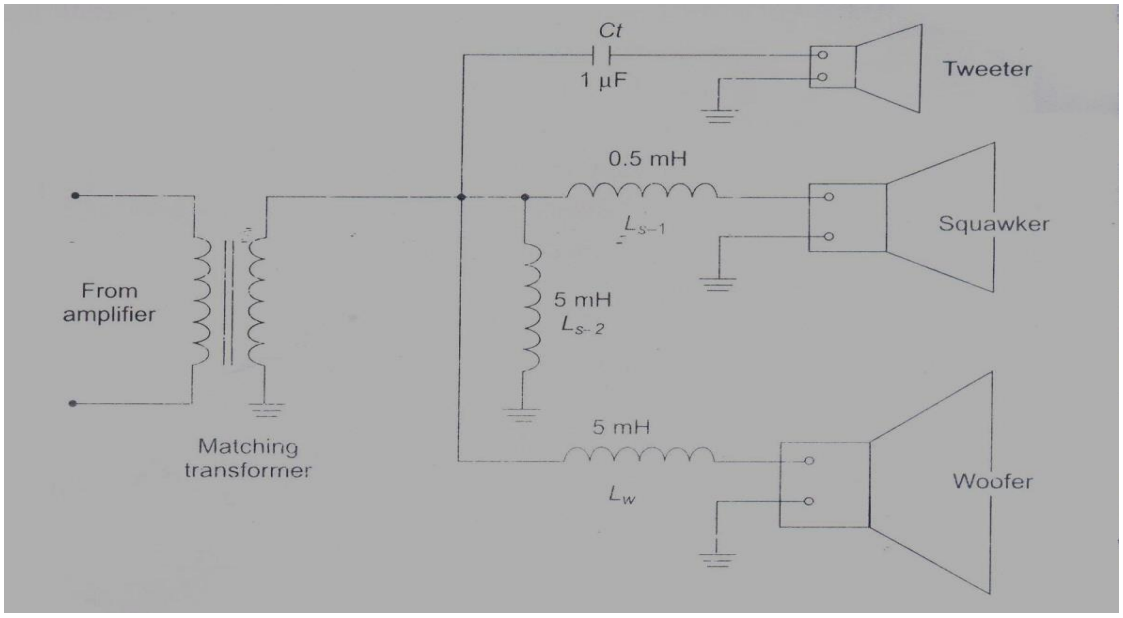


Closed Circuit Television (CCTV) (2 Marks)

- Closed Circuit Television (CCTV) are used for industrial applications, security and surveillance, education and training, public information displays and many others. In some of the above mentioned applications CCTV are characterized by less complex circuitry and low cost where professional grade broadcast standards are not required.
- In CCTV the pickup camera tubes generally used are vidicon for industrial and medical X-ray applications, plumbicon is used for high light applications, multidiode silicon vidicon and charge coupled device camera are used for security and surveillance.
- Solid state circuitry is used in the camera unit and the display units. Considerable simplification is possible due to random interlace system and less simple type signal waveform called as 'industrial sync'.
- In case of closed circuit television the composite video signals are not modulated. They are directly fed to the video receivers. CCTV does not follow the television broadcast standards. The block diagrams for direct camera link and wireless link are as shown in figure.

d) Compare following types of loud speakers with respect to any four points (as frequency range, size, sketch, application, their frequency response etc.)

Ans. **(1 Mark for each correct point)**

Parameters	**Woofer**	**Mid-range speaker or squawker**	**Tweeters**
Frequency range	It covers low frequencies from 16 Hz to 500 Hz.	It is used for mid frequency range from 500 to 5000 Hz	It covers high frequency range from 5000 Hz to 20 KHz.
Size	It has a heavy and large diameter cone	It has medium diameter cone	It has a light and small diameter cone.
Application	They are used in PA system as they have high efficiency.	TV sets and cheap radio sets have mid-range speakers.	They are electrodynamics drivers.
Frequency response	Attenuation beyond the cut-off frequencies is 12dB per octave	It operates between the cut-off frequencies of woofer and tweeter.	Attenuation before the cut-off frequencies is 12dB per octave.
Sketch			

e) State TV channel allocation for band I and band III.

Ans.

The carrier frequency should be chosen ten times of highest modulating frequency to get better selectivity at RF and IF tuned amplifier in the receiver. Highest frequency for picture signal is 5MHz. Hence, the carrier frequency is always greater than 40 MHz. TV transmissions is generally in VHF and UHF.

VHF band= 30 to 300 MHz

UHF band=300 to 3000MHz.

Lower band VHF channel (band I): band I has three channels 2, 3 and 4 from 47 to 68 MHz

Higher VHF Channels (band III): band III channels 5 to 12 from 174 to 230 MHz

VHF band –I (47-68 MHz) channel width =7MHz (2 Marks)

Channel no	Frequency band(MHz)
2	47 to 54
3	54 to 61

VHF band- III (174-230 MHz) channel width =7MHz (2 Marks)

Channel number	Frequency band(MHz)
5	174 to 181
6	181 to 188
7	188 to 195
8	195 to 202
9	202 t0 209