WINTER– 16 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 judgement 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. No.	Sub Q.N.	Answer	Marking Scheme
Q.1		**Attempt any Three**	**12-Total Marks**
1	**a)**	**Compare stereo amplifier and mono amplifier. (Any four points).**	**4 M**
	Ans:		**(Each point:1M)**

Parameters	Mono Amplifier	Stereo amplifier
Function	Amplifies Monaural or monophonic sound	Amplifies Stereophonic sound
Key feature	Audio signals are routed through a single channel	Audio signals are routed through 2 or more channels to simulate depth/direction perception, like in the real world.
Recording	Easy to record, requires only basic equipment	Requires technical knowledge and skill to record, apart from equipment. It's important to know the relative position of the objects and events.
Cost	Less expensive for recording and reproduction	More expensive for recording and reproduction
Circuit Complexity	Less Complex then	More Complex
Usage	Public address system, radio talk shows, hearing aid, telephone and mobile communication, some AM	Movies, Television, Music players, FM radio stations

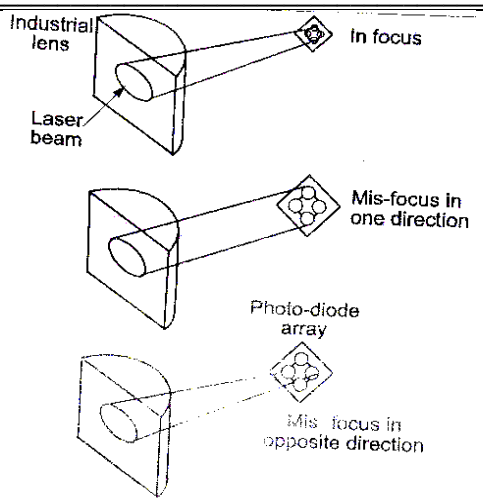
	radio stations		
Circuit Diagram	Draw circuit diagram of mono amplifier system	Draw circuit diagram stereo amplifier system	
Signal to Noise ratio	Less signal to noise ratio	Better than 50 dB is the S/N ratio.	
Distortion	Nonlinear distortion occurs.	Nonlinear distortion not more than input/output.	
Use of equalizer	Equalizers are not used	Contains equalizer circuit.	

b)	**Why dish antenna is having parabolic shape and meshy surface ? List any four specifications of dish antenna.**	**4M**
Ans:	• While installing the dish antenna look angles are taken into consideration. Once look angel adjusted installation should not be disturbed Due to atmospheric changes like rain, wind there is a possibility of change in look angle of dish, Due to meshy structure, rain and wind will go through holes by keeping fix position of dish antenna. • The parabola is a plane curve defined as the locus of point which moves so that its distance from another point (called the focus) plus its distance from a straight line (directrix) is constant. These geometric properties yield an excellent microwave or light reflector. **<u>Specification of Dish Antenna</u>:** • Size-8 feet. • Gain-36 dB or 42dBi/40.7dBi. • Band-C-(3.7 to 4.2 GHz downlink frequency). • Look angle- 360 degree rotation in azimuth.18 to 90 degree rotation in elevation. • Offset angle-24.62 limit. • Focal length – 90 cm. • Elevation angle range= 17 to 90 limit • Azimuth angle = 0 to 360 degree • Aperture efficiency= 75% • Diameter: 5m/3.7GHz • Mount: Azimuth elevation type • Drive: Motorized & manual • Wind velocity: 100kmph	**(2M reason, ½ M each for 4 specification)**
c)	**Define Aspect ratio. Why width of the TV screen is more than height?**	**4M**
Ans:	**<u>Aspect Ratio:</u>** The aspect ratio of an image describes the proportional relationship between its width and its height. The frame adopted in all television systems is rectangular with width/height ratio, i.e., aspect ratio = 4/3.	**(2M :Definition & 2M:reason)**

$$Aspect\ Ratio = \frac{Width\ of\ the\ Screen}{Height\ Of\ the\ Screen} = \frac{4}{3}$$

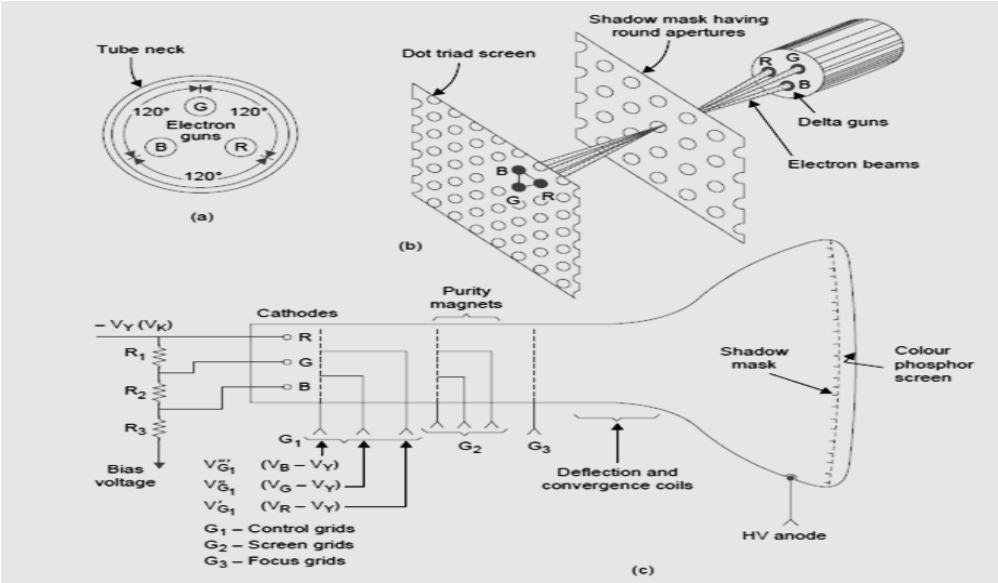
- In human affairs most of the motion occurs in the horizontal plane and so a larger width is desirable. The eyes can view with more ease and comfort when the width of a picture is more than its height.
- The usage of rectangular frame in motion pictures with a width/height ratio of 4/3 is another important reason for adopting this shape and aspect ratio. This enables direct television transmission of film programs without wastage of any film area.

d)	**List the different lenses used in CD player. State their functions.**	**4 M**
Ans:	Types of Lenses used in CD player. 1. Collimation lens 2. Concave lens 3. Objective lens 4. Cylindrical lens Collimation lens: • The collimator lens is used to produce completely parallel beams of laser. This lens together with the objective lens is used to focus the laser beam to the disc surface. Concave lens: • In single-beam linear optical block assembly this concave lens is used to concentrate the laser beam, reflected from the disc surface, onto the photodiode array. This lens is mainly used to improve the sensitivity of the photodiode array. Objective lens: • Before hitting the disc surface, the laser beam comes out of the pickup assembly through an objective lens. The objective lens is used to focus, laser beam onto the CD surface and to receive the reflected laser beam. • This lens is moved up/down to achieve the focus of the laser beam on the disc face. The objective lens is always kept in focus using a system similar to the voice system used in the audio speakers. • It is also moved horizontally in the linear pickup assembly to keep the laser in proper track. In players that used the radial tracking method the objective is unit does not move horizontally (laterally). Cylindrical lens (in Three-Beam Linear Optical Blocks):	**(listing: 1M, Functions: 3M)**



- The main action of this lens is to enable the reflected beam from the CD to assist in creating the necessary signal to make sure that focus of the laser beam on the playing surface the disc is maintained.
- As shown in the fig. when the beam is correctly focused a circular beam of light will land on the four photodiode elements. If the beam becomes out of focus the cylindrical lens will distort the beam elliptically.
- As shown in the fig. the distortion depends upon the direction of mis-focus. This distortion is known as astigmatism.

b)	**Attempt any <u>One</u> of following:**	**6M**
a)	**Describe the working principle and construction of Delta gun picture tube.**	**6 M**
Ans:	**<u>Diagram:</u>**	**3M**



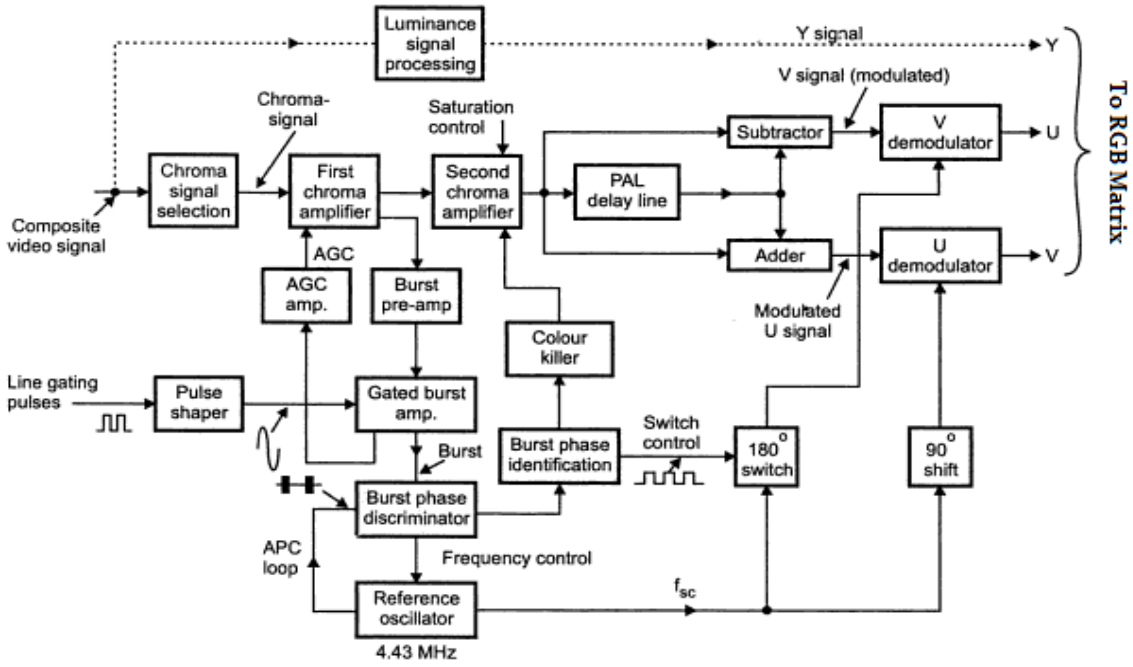
(a) guns viewed from the base
(b) electron beams, shadow mask and dot-triad phosphor screen
(c) showing application of 'Y' and colour difference signals

Working: **3M**

- This tube was first developed by the Radio Corporation of America (R.C.A.). It employs three separate guns (see Fig. (a), one for each phosphor. The guns are equally spaced at 120° interval with respect to each other and tilted inwards in relation to the axis of the tube. They form an equilateral triangular configuration.
- As shown in Fig.(b) the tube employs a screen where three colour phosphor dots are arranged in groups known as triads. Each phosphor dot corresponds to one of the three primary colours.
- The triads are repeated and depending on the size of the picture tube, approximately 1,000,000 such dots forming nearly 333,000 triads are deposited on the glass face plate. About one cm behind the tube screen (see Figs. (b) and (c)) is located a thin perforated metal sheet known as the shadow mask.
- The mask has one hole for every phosphor dot triad on the screen. The various holes are so oriented that electrons of the three beams on passing through any one hole will hit only the corresponding colour phosphor dots on the screen.
- The ratio of electrons passing through the holes to those reaching the shadow mask is only about 20 percent. The remaining 80 percent of the total beam current energy is dissipated as a heat loss in the shadow mask.
- While the electron transparency in other types of colour picture tubes is more, still, relatively large beam currents have to be maintained in all colour tubes compared to monochrome tubes.

b) Draw the block diagram of PAL-D decoder. Describe the function of each block.

Ans: **Diagram:** **3M**



Block diagram of PAL-D decoder

3M

Explanation :

Chroma signal selection:

- Its function is to select Chroma and colour burst signal from the incoming CCVS signal. It essentially consist of band pass circuit whose center frequency is chosen to be equal to that of Chroma sub-carrier itself i.e.4.43MHz.

1st Chroma amplifier:

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

2nd Chroma amplifier:

- The second Chroma amplifier incorporates colour saturation control circuit. The output of colour killer also feeds into it.

PAL delay line (separation of U and V colour 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.

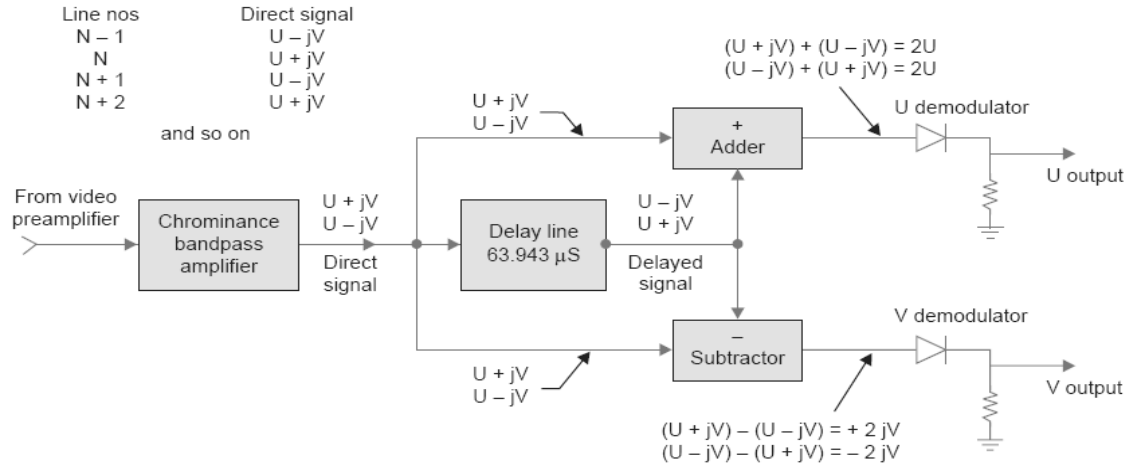
180^{o} switch:

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

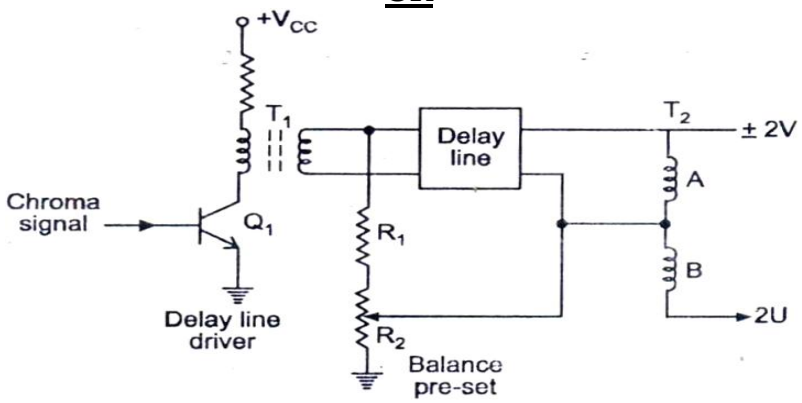
Colour killer control:

- 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 cut off state**.**

Q 2		Attempt any four:	16 M
	a)	**Describe how separation of U and V signals is achieved in colour T.V. with the help of suitable circuit diagram.**	4 M
	Ans:	***Note: Any other relavent diagram can be considered.*** **Diagram:**	2M

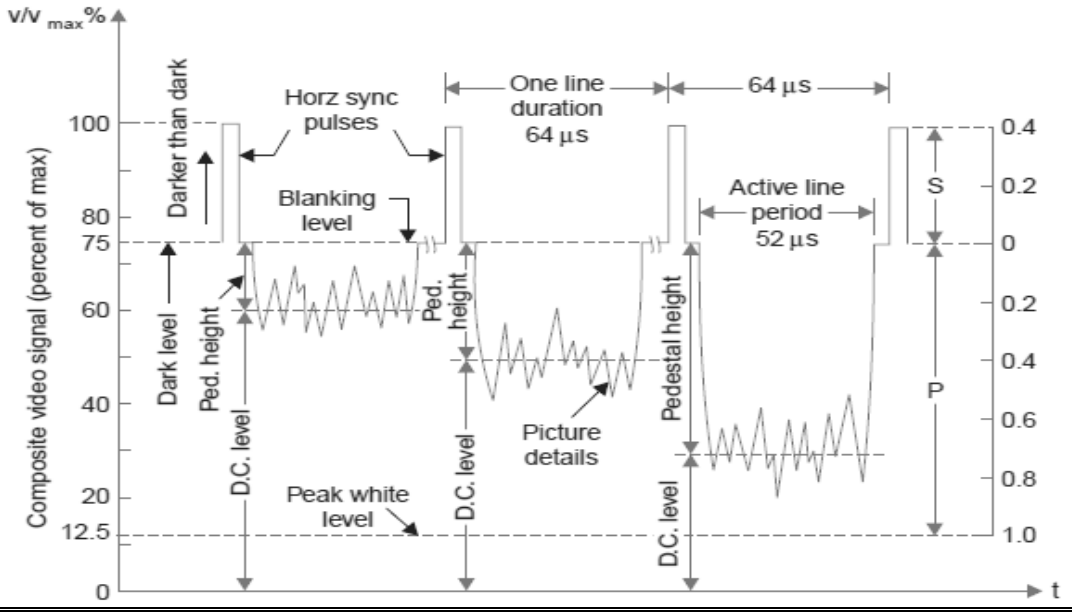
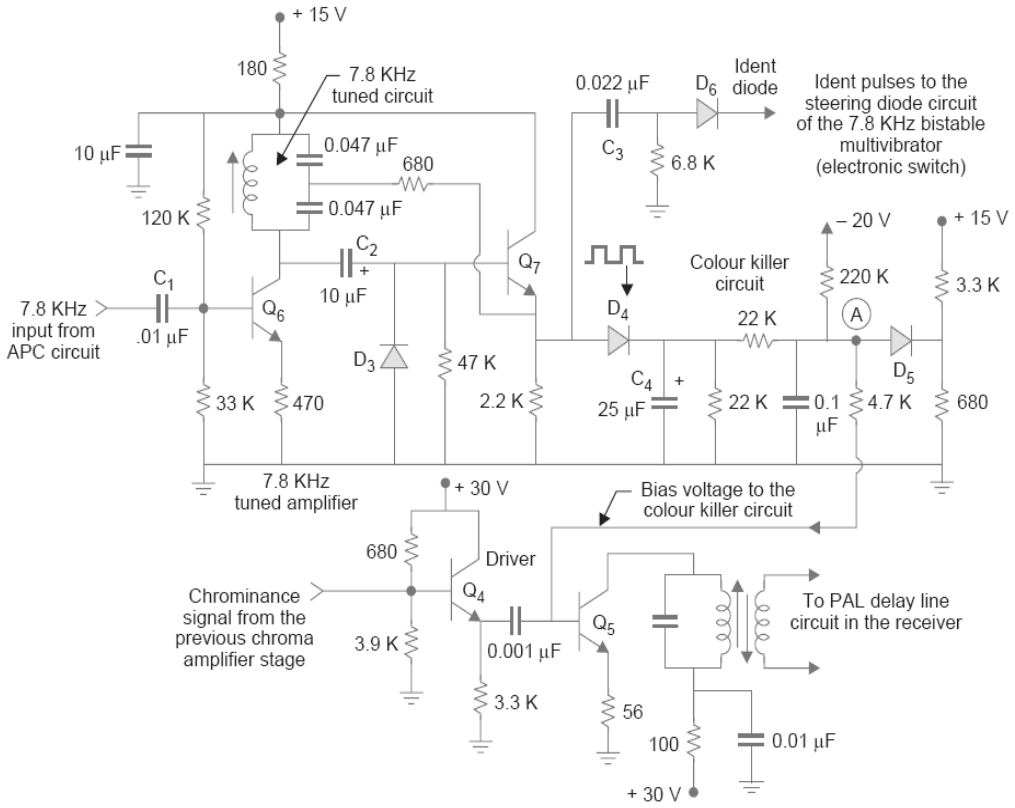


OR



Explanation : 2M

- The basic principle of U & V signal separation by transformer action is shown in fig. It consists of transistor Q1, Transformer T1, PAL delay line & a center tapped transformer T2.
- The delay line driver transistor Q1 feeds the amplified Chroma signal through transformer T1 into the delay line.
- The signal after passing through the delay line appears across 'A' winding of the transformer T2. Chroma signal is also fed directly at the center tap of transformer T2 through the potentiometer R2.
- As T2 is center tapped with equal no. of turns in 'A' & 'B', the voltage induced by the signal from delay line will be equal in amplitude but out of phase in winding A & B.
- Thus direct & delayed Chroma signals are applied in the same phase in one winding & out of phase in the other winding.
- This results in separation of U & V signals as explained in fig. given Above.

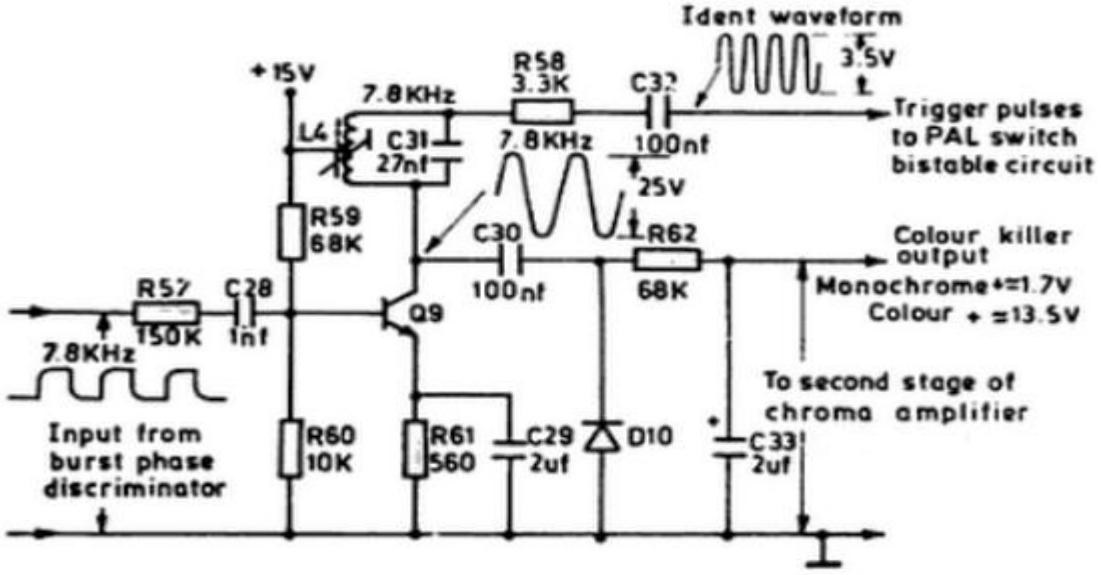
b)	**Draw neat labeled sketch of composite video signal.**	**4 M**
Ans:	**Diagram:**  	**(Diagram: 3M Labeling:1 M)**
c)	**Draw the colour killer circuit. Describe it's working. Why and where it is used?**	**4 M**
Ans:	**Diagram:**  Colour killer circuit.	**1M**

Working:

2M

- The colour killer circuit is shown in Fig. The forward bias of Q5, the last stage of bandpass amplifier depends on the state of the colour killer circuit.
- When a colour signal is being received, the 7.8 KHz (switching rate of the (R – Y) signal) component is available at the APC (automatic phase control) circuit of the reference subcarrier oscillator.
- It is applied via C1 to the base of tuned amplifier Q6. The amplified 7.8 KHz signal is ac coupled to Q7. Diode D3 conducts on negative half cycles charges the capacitor C2 with the polarity marked across it.
- The discharge current from this capacitor provides forward bias to Q7, the emitter follower. Such an action results in a square wave signal at the output of Q7. It is coupled back via a 680 ohm resistor to the tuned circuit in the collector of Q6.
- This provides positive feedback and thus improves the quality factor of the tuned circuit. The colour killer diode D4 rectifies the square-wave output from the emitter of Q7.
- The associated RC filter circuit provides a positive dc voltage at point 'A' and this serves a source of forward bias to the chrominance amplifier Q5. Diode D5 is switched on by this bias and so clamps the voltage produced at 'A' by the potential divider (3.3 K and 680 ohm) across the + 15 V line.
- When a monochrome transmission is received there is no 7.8 KHz input to the colour killer diode D4 and no positive voltage is developed at its cathode (point A).
- Both D5 and the base emitter junction of Q5 are now back biased by the – 20 V potential returned at 'A' via the 220 K resistor. The chrominance signal channel, therefore, remains interrupted.

OR



Working:

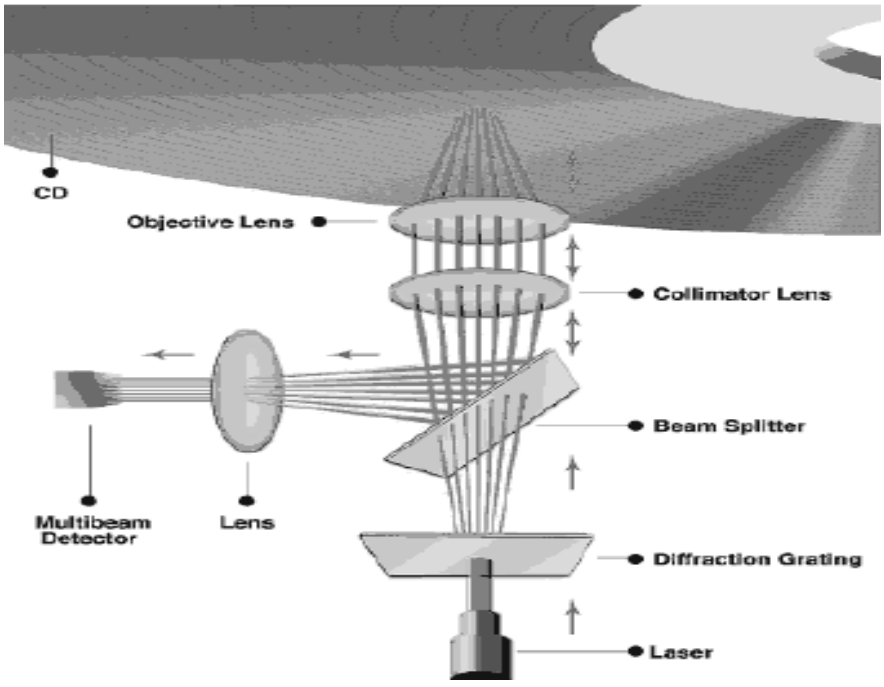
- The dc operating voltage to Q9 is supplied via center tap on L4. Such a connection causes L4 to function as a tuned transformer & enables a waveform of about 25V peak-to-peak to be developed at the collector of Q9.
- This is fed via C30 to diode D10 which functions as a HWR. The components R62 & c33 form a LPF which provides a steady dc level of about 13.5V as the output. This is the colour killer voltage which is used to control conduction of the second stage of Chroma signal amplifier.
- When a black and white picture is being received, there is no output from the burst discriminator & hence, no input to burst phase ident amplifier.
- Under this condition the colour killer output fails to less than 2V which is not enough to forward bias transistor of the Chroma amplifier. Thus the second Chroma amplifier stage is inhibited.
- This prevents application of any signal to the Chroma delay line & to the U & V demodulators. Thus any stray coloring signals are prevented from reaching RGB amplifier & hence, no colour noise appears on the black & white picture during monochrome receptions.

Why it is used: The Colour killer circuit is used to block the color signal in the receiver circuit to reproduce Black & white picture from colour signal.

Where it is used: It is used in colour TV receiver circuit, between first & Second Chroma amplifier.

1M

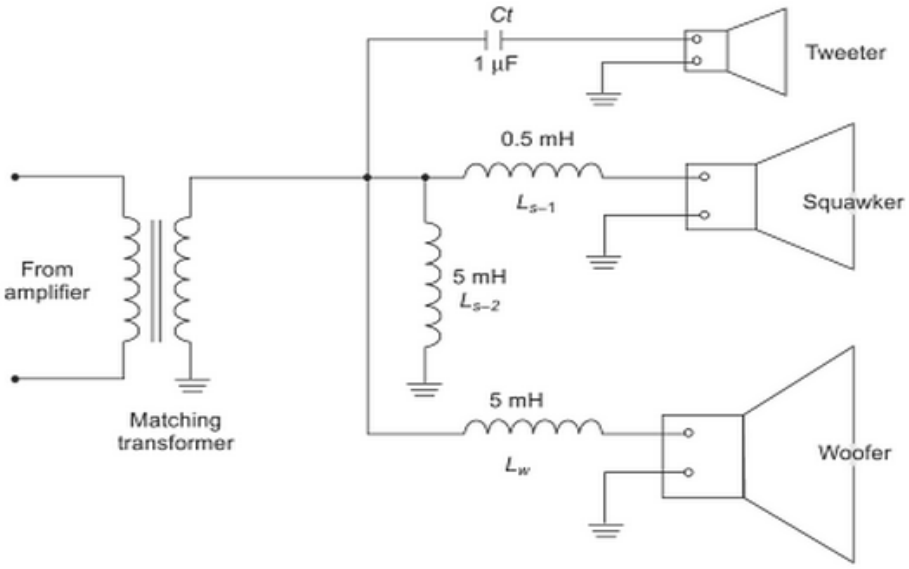
d)	**Describe the working of pick-up assembly of CD player with the help of neat sketch.**	**4 M**
Ans:	***Note: Any other relavent diagram can be considered.*** **Diagram:**	**2M**



		Working: • A low power laser diode to illuminate the CD tracks. • Lens and prism arrangement to direct the laser beam to the CD surface and to direct the reflected laser beam towards photodiode array. • A photodiode array to obtain data, focus and tracking signal from the reflected laser beam. • Focus and tracking coils to focus the beam to the CD surface and to move the assembly to proper track across the disc surface. • Some optical units do not contain the tracking coil, for example, the single-beam radial tracking assembly, this is explained in latter sections. • In the optical pickup unit, the laser diode emits laser beam from a small point into an elliptical or conical distribution. This beam is passed through various prism and lens to form a very small diameter light beam on the disc surface at the center of the track. • The objective lens is controlled by the tracking and focusing coil to keep the beam focused on the CD and to keep the condensed beam at the center of the track. • This laser beam is reflected back by the flat area and the pits on the disc surface. This reflected beam is applied to a group of photodiodes through objectives lens, collimator lens and some prism arrangement. • These photodiodes induce voltage according to the reflected beam falling on it. Focus error and tracking error voltage generated by this photodiode array is applied to the tracking and focusing coil to control the objective lens and data signal generated by this photodiode array is sent to an amplifier to amplify the data signals picked-up from the disc. • Finally, the output from the amplifier is processed to produce the audio signal stored on the disc surface.	**2M**
e)		**Describe NHK and MOSE system for HDTV.**	**4M**
Ans:		**Note: Question is wrongly typed. It should be *Describe NHK and MUSE system for HDTV*.** **Description:** • MUSE stands for Multiple Sub-Nyquist Sampling Encoding and is an HDTV bandwidth compression scheme developed by NHK. • It uses fundamental concepts for performance exchange in the spatio – temporal (transitory transformation) domain along with motion compensation to reduce the transmission bandwidth down to near about 10 MHz. • The processed HDTV signal can be then transmitted using a single BDS channel. • Temporal Interpolation In MUSE the luminance and colour information are sent by time multiplexed components (TMC) The colour information is sent sequentially with a time compression of four. • The TMC signal is bandwidth reduced means of 3 – dimensional offset subsampling pattern over a four – field sequence.The stationary areas of the picture are reconstructed by temporal interpolation of samples from four fields.	**4M**

	f)	**Draw the circuit of three way cross over network. Illustrate distribution frequencies of respective speakers.**	
	Ans:	***Note: Any other relavent diagram can be considered.***	**2M**

Diagram:



2M

Distribution frequencies:

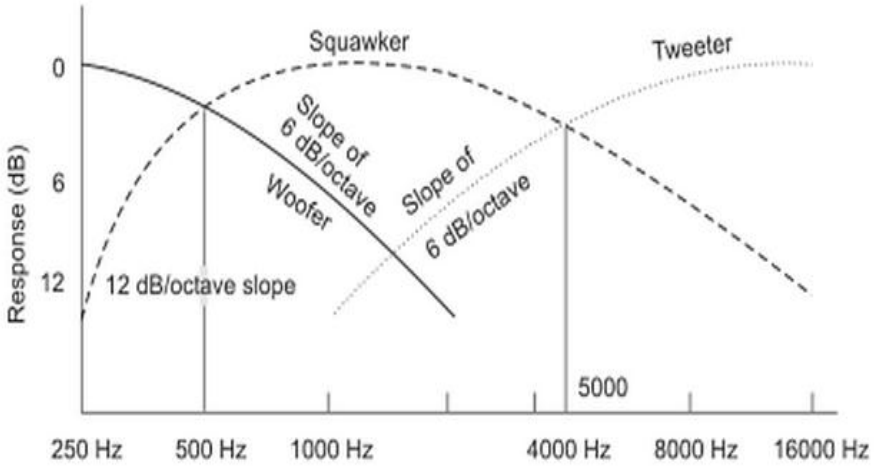
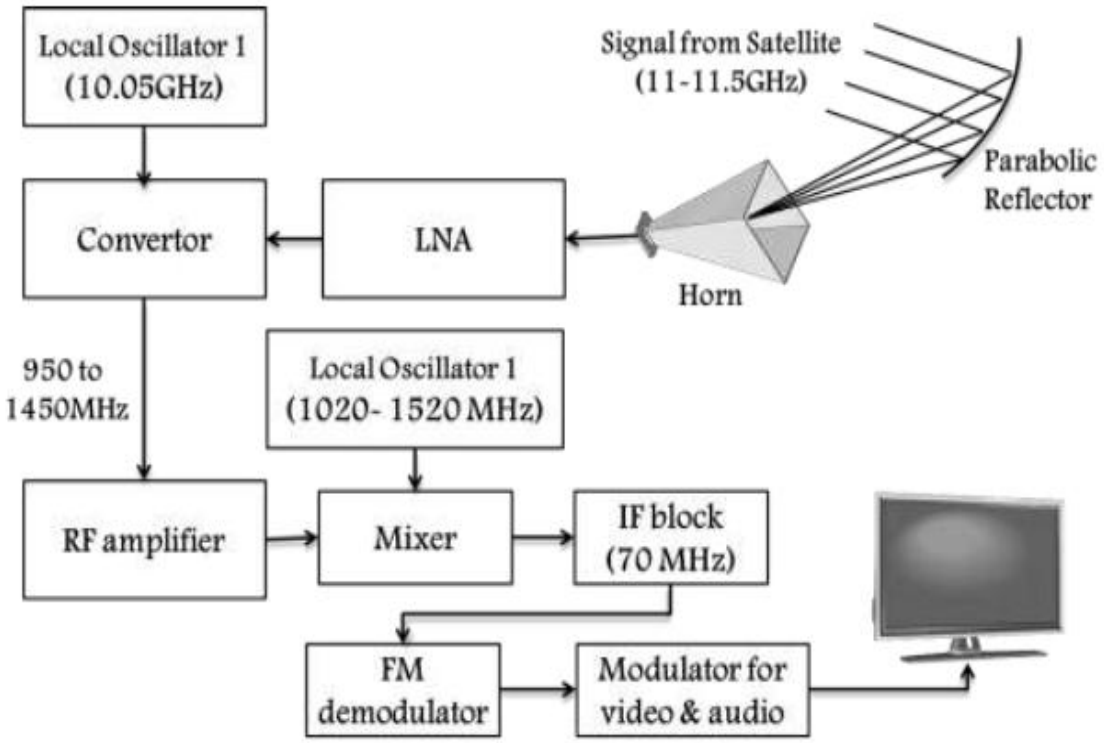


Fig. *Response curves for a three-way speaker system*

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

Q. 3		Attempt any Four:	16 M
	a)	**Draw and describe DTH system**	4 M
	Ans:	**Diagram:**	2M



2M

Explanation:-

Direct to home technology refers to the satellite television broadcasting process which is actually intended for home reception. This technology is originally referred to as direct broadcast satellite (DBS) technology.

In short, DTH refers to the reception of satellite signals on a TV with a personal dish in an individual home. The satellites that are used for this purpose is geostationary satellites.

1)Outdoor unit:

It consists of a receiving antenna, low noise amplifier & converter the receiving antenna is parabolic reflector with a horn as the active element. The horn can be directly in front of reflector, or it may use an offset feed as shown in fig. The reflector diameter may be 0.6m for 11GHz & still smaller for K & Ka bands.

- The low noise block consists of a low noise wide band amplifier followed by a convertor. The output of convertor consists of a signal of UHF frequency ranging from 950-1450MHz.
- The advantage of using UHF frequency is that a low cost coaxial cable can be used as feeder from the outdoor unit to the indoor unit.
- LNB cannot be kept indoor because long cable between horn & the first amplifier will cause substantial degradation of the overall noise figure of the set.

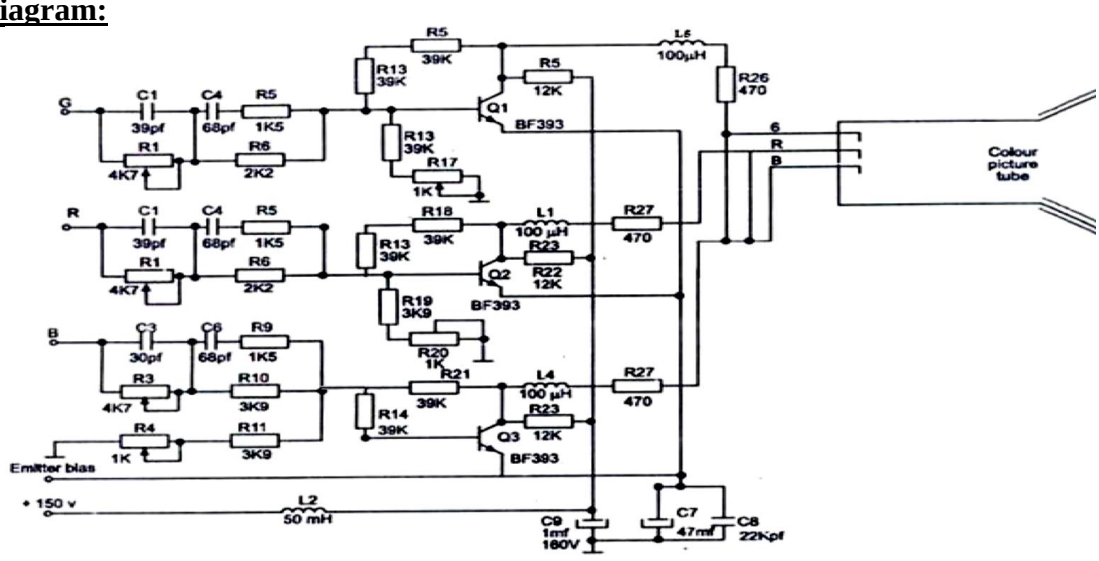
2)Indoor unit:

The wideband signal from the LNB is fed to an RF amplifier. The amplified signal is fed to a channel selector circuit which selects the wanted band.

The selected channel is down converted to a fixed IF of 70MHz by local oscillator & mixer. IF amplifier amplifies the signal which then goes to FM detector.

The detector recovers original baseband signal, consisting of CVS & audio signal. These modulated signals are fed to the normal domestic TV receiver, which after due processing reproduces picture & sound.

b)	**Draw the circuit diagram of RGB drive amplifier and describe its operation.**	**4 M**
Ans:	**Diagram:**	**2M**



2M

Explanation:-

- ✓ The 3 amplifiers are of same design so their frequency response is nearly same. 3 amplifiers are identical so only 1 is considered to explain.Q1 of green signal amplifier is connected in CE configuration. 150 V dc supply is filtered by L2 and C9, C7 and C8 are bypass to the emitter supply.
- ✓ R21 and R14 provide negative feedback to improve dc stability.L4 in the collector load used to extend bandwidth.C3 at input to amplifier is to improve step response.
- ✓ The D.C. collector voltage determines the picture tube cut-off voltage is fixed by R11 & R4 is varied for monochrome reproduction at high lights.
- ✓ RGB amplifier circuit consists of three identical video amplifiers for driving the 3 cathodes of picture tube. The inputs of amplifiers obtained from the decoded red, green and blue outputs of Chroma IC. Q1, Q2, Q3 are high frequency transistor of type BF393 or BF 869.

2M

c)	**Describe operation of Dolby A system of noise reduction.**	**4 M**
Ans:	**Explanation:**	**2M**

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

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

Block Diagram: **2M**

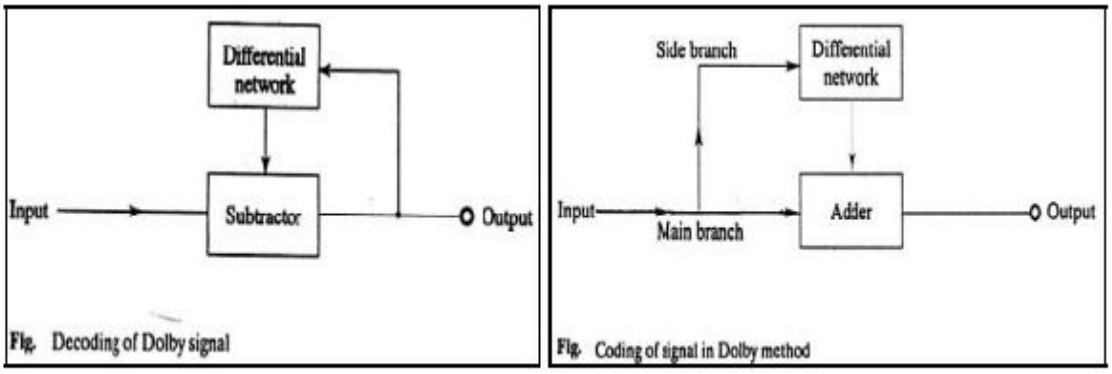
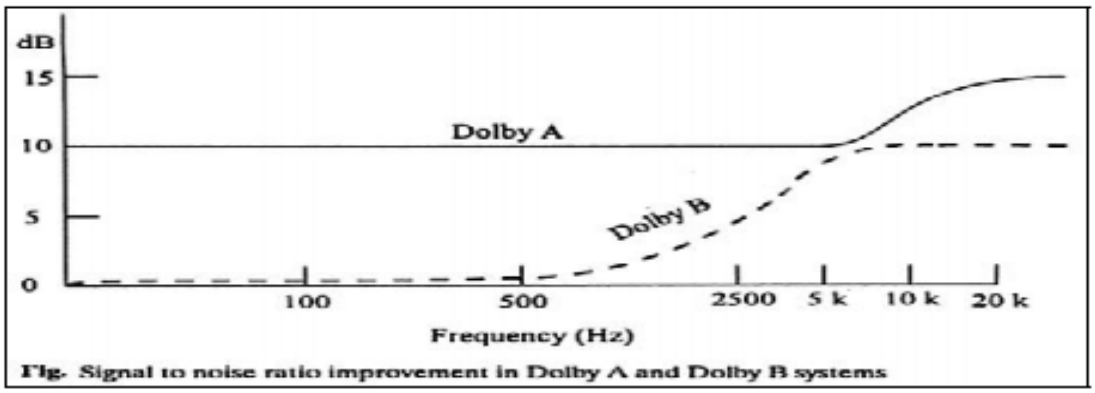


Figure: Dolby A method

Note: SNR Graph optional



d) **List any four advantages of fluorescent display system used in CD player.** **4 M**

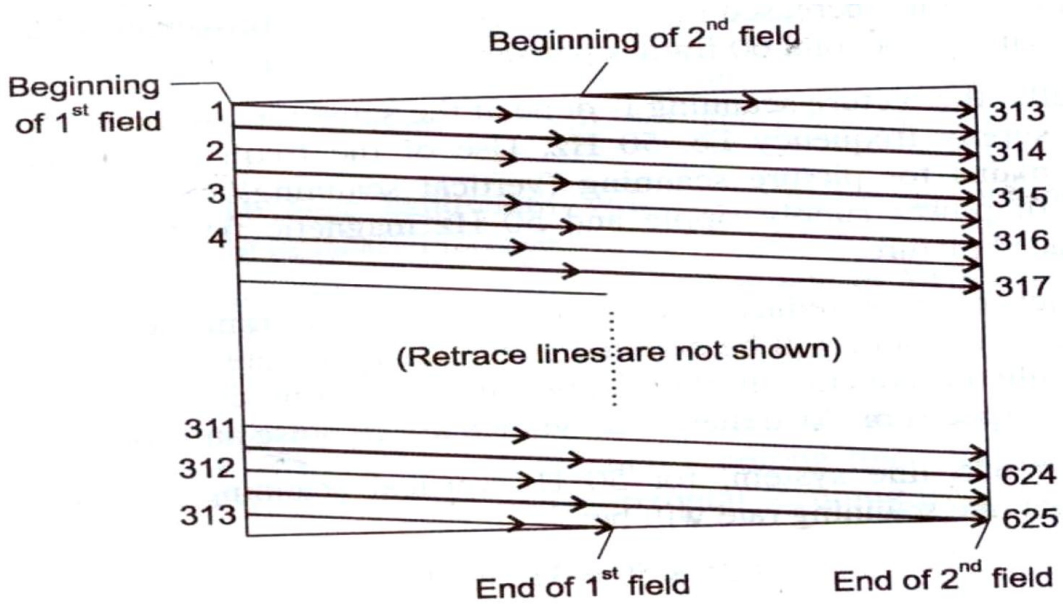
Ans: **Advantages of fluorescent display system are: (Any four)** **(Any 4 points: 1M each)**

- Emits a very bright light with clear contrast.
- Easily support display elements of various colors.
- The light produced by most VFDs contain many colors and can often be filtered to produce a more pure colour such as deep green or deep blue.
- Being rugged, inexpensive.
- Easily configured to display a wide variety of customized messages.
- Most VFD's continue to function normally in subzero temperatures making them ideal for outdoor devices in cold climates.
- 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.

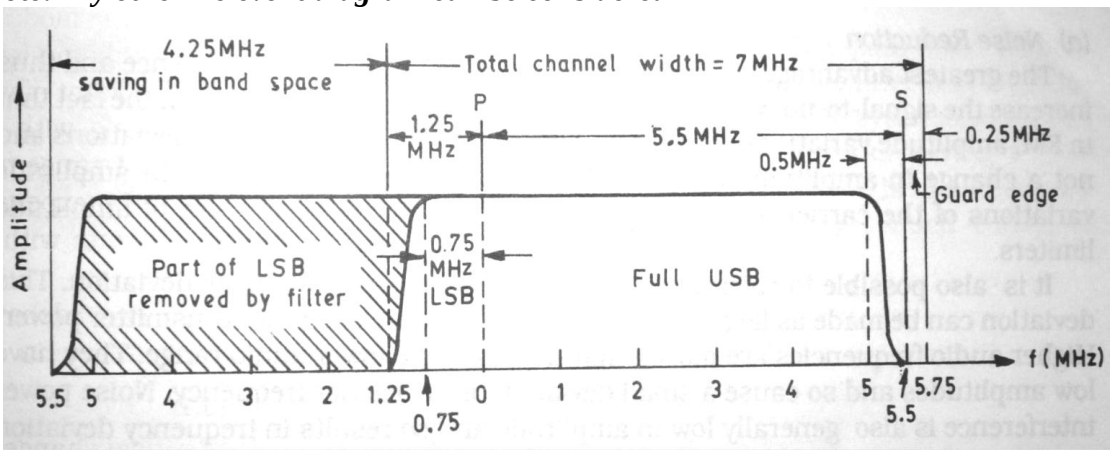
e) **State any eight CCIR-B standard for colour signal transmission and reception in TV.** **4M**

Ans: **(Any eight standards- ½ M 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

Q. 4		Attempt any Three:	12 M
	a)	**Describe interlace scanning in brief. How interlace scanning help to reduce bandwidth of video signal?'**	4 M
	Ans:	**Diagram:** 	2M
		Explanation: • To reduce flicker, an effective rate of 50 vertical scans per second is utilize in television pictures system. • This is accomplished by increasing the downward rate of travel of the scanning electron beam. By increasing downward scanning rate, every alternate line gets scan instead for every successive line. After the 1st scan the beam reach the bottom of picture frame, the beam quickly returns to the top to scan remaining lines which are missed in 1st scan. • Thus the total number of lines in picture frame are divided into are two groups called as fields. Each field is scan is scan alternately. This is called as interlaced scanning. • It reduces flicker, which results in reduction of bandwidth and noise. • This figure shows 625 lines T.V. system a frame of 625 lines is divided into two fields having 312.5 lines each. Each field is scanned alternately to cover the entire picture. • In first field, 312.5 odd lines are scanned only, which is called as odd field. The scanning sequence is 1, 3, 5, 7 … • After this the beam spot returns to the top of the screen and remaining half part of the 313th lines and all even number of lines are scanned. This is called as even field. The scanning sequence is 2, 4, 6… • To achieve this, the vertical sweep oscillator (saw tooth waveform) made to operate at 50Hz frequency so that to successive interlaced scans make up the complete picture frame. • This method reduces flicker.	2M

	b)	**Describe VSB transmission. State it's any four advantages.**	**4 M**
	Ans:	**Diagram:** ***Note:Any other Relevent diagram can be considered***	**1M**

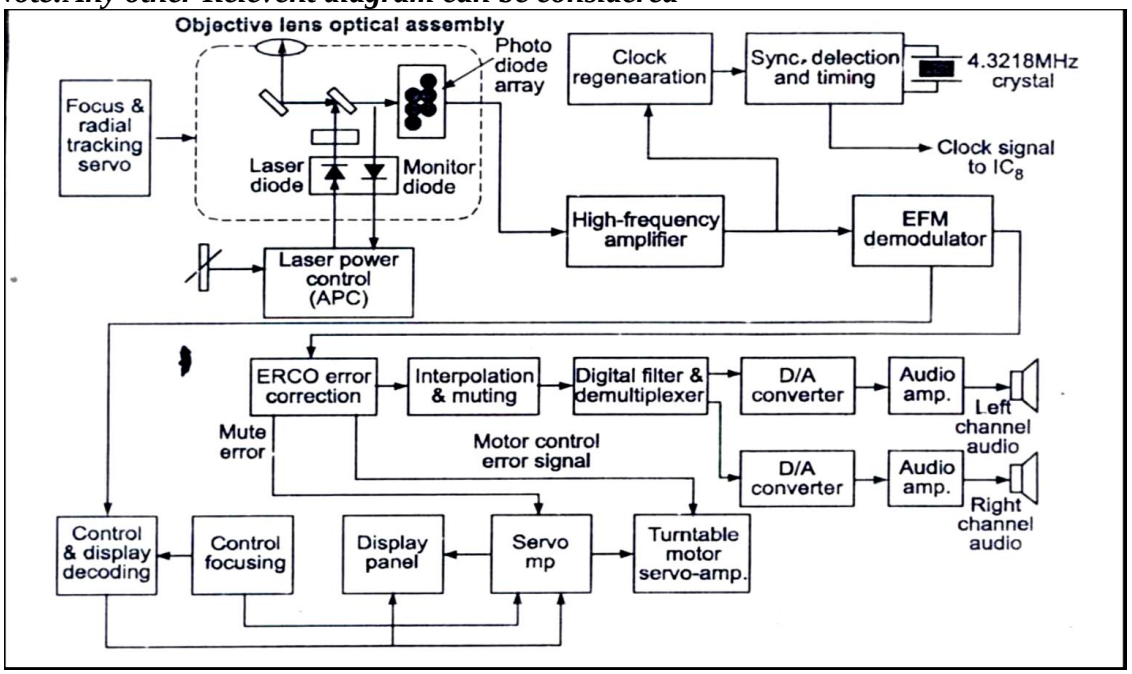


Explanation: **1M**

- The low video frequencies contain the most important information of the picture and any effort to completely suppress the LSB would result in phase distortion at these frequencies. This distortion will be seen by the eye as "smear" in reproduced picture.
- Therefore as a compromise, only a part of the lower sideband, is suppresses, and the radiated signal then consists of a full upper side band and a carrier signal and vestige (remaining part) of the partially suppresses lower sideband.
- This pattern of transmission of the modulated signal is known as Vestigial Sideband transmission.(VSB).
- In 625 line system, frequencies up to 0.75MHz in the lower sideband are dully radiated.
- Because of filter design difficulties it is not possible to terminate the B.W. of a signal abruptly at edges of the sidebands.
- As shown in figure above saving of band space which results from vestigial sideband transmission. The picture signal is seen to occupy a bandwidth of 6.75MHz instead of 11MHz.

Merits of VSB: **2M**

- Bandwidth is reduced so that more number of channels can be accommodated in a given frequency spectrum.
- Power saving of 50% is possible.
- Filter design becomes practicable.
- More efficient.
- Noise reduction.

c)	**Draw neat labelled block diagram of CD player.**	**4 M**
Ans:	**Diagram:** ***Note:Any other Relevent diagram can be considered*** 	**4M**
d)	**Compare CATV and CCTV (any four points).**	

Ans:	**Cable Television (CATV)**	**Closed Circuit Television(CCTV)**	**Any 4 points-1 M**
	The CATV monitor has RF, IF as well as detector stages.	CCTV monitors does not have RF,IF and detector stages.	
	Audio section is present	Audio section is not present.	
	Pay-TV channels are present in CATV with additional fees.	Pay-TV channels are not present.	
	Internet services can be provided	Internet service cannot be provided.	
	CATV service provider can broadcast live programs from studios, some events etc. on their local TV channels	Such facilities are not available	
	Various channels such as scientific, geographic, sports news, entertainment etc. are provided by CATV.	Such channels are not provided in CCTV.	
	CATV system is huge system covering not only a small community but also large areas rather a whole city.	CCTV can cover only small area where it is installed for example a hospital, college etc.	
	Camera range of CATV is more with higher resolution.	CCTV camera range is limited to only some distance with less resolution.	
	Applications: CATV‟s are used in homes, malls, shops for entertainment and value added services and in corporate and business environment for internet services.	**Applications:** It is used for surveillance in college campus, industry, traffic control, crowd control and also used for medical care and safety.	

B) Attempt]any one: **6 M**

a) Compare NTSC, PAL and SECAM system (any six points). **6 M**

Ans: **(Any 6 points-1 M each)**

Sr. No.	Parameter	PAL	NTSC	SECAM
1.	Full form of system	Phase Alternation of Line	National Television System Committee	Sequential Colour A Memory
2.	Inventing country.	Germany in 1967	USA in 1957	France in 1970
3	Countries where used.	Germany, India, UK	USA, Canada, Japan, Mexico.	France, East Europe, Africa.
4	Transmission of colour.	By colour difference signals.	By colour difference signals.	By colour difference signals.
5	Video bandwidth.	5 MHz	4 MHz	6 MHz
6	Noise	High	High	Very high.
7	Identification signal	Needed	Not needed	Needed
8	Cost	Costliest	Less than PAL but higher than SECAM	Cheapest

b) Describe why equalizing pulses are required. Draw the vertical synchronizing pulse structure. **6M**

Ans: **2M**

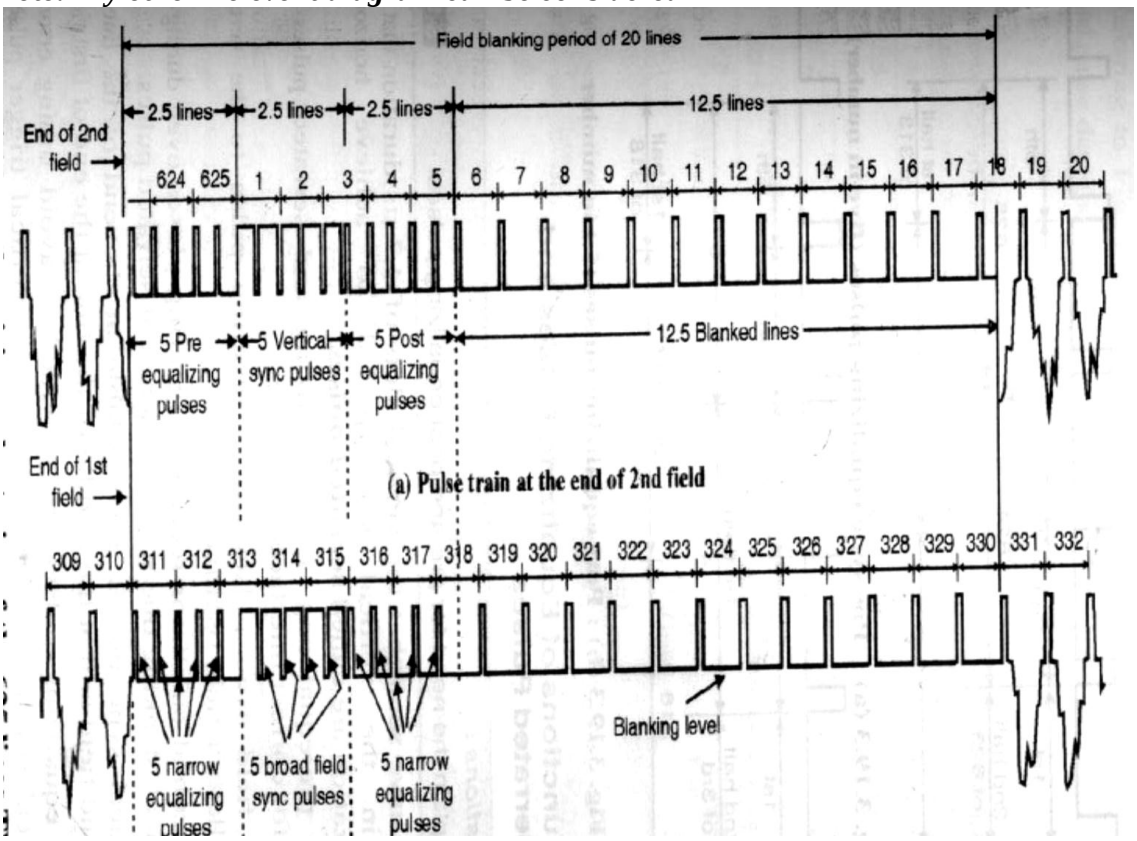
Explanation:

This is a ½ line difference just prior to the start of serrated vertical pulse.

- This ½ line difference does not affect the horizontal deflection synchronization but it does affect the vertical synchronization and the interlaced scanning. The effect of uneven line period can be reduced by increasing the interval between the preceding line pulse and the field sync pulses.
- To ensure that the vertical deflection oscillator receives the necessary triggering voltage at the same time after every field, a series of five narrow pulses 2.3 μs each, occurring at half line rhythm, are inserted before the field sync pulse.
- These are called pre equalizing pulses. The width of equalizing pulse is normally half the width of horizontal sync pulses, roughly half of 4.7 μs or (2.3 μs).
- The equalizing pulses inserted after the vertical synchronizing pulses are post equalizing pulses. These equalizing pulses do not disturb the operation of either oscillator, yet they permit the vertical sync pulse to occur at the correct time after every field.

Diagram: **4M**

Note:Any other Relevent diagram can be considered



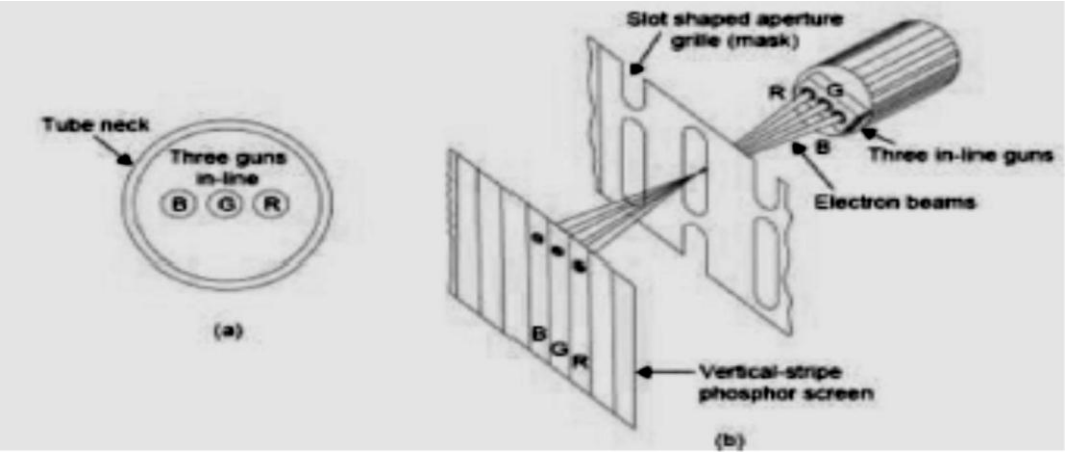
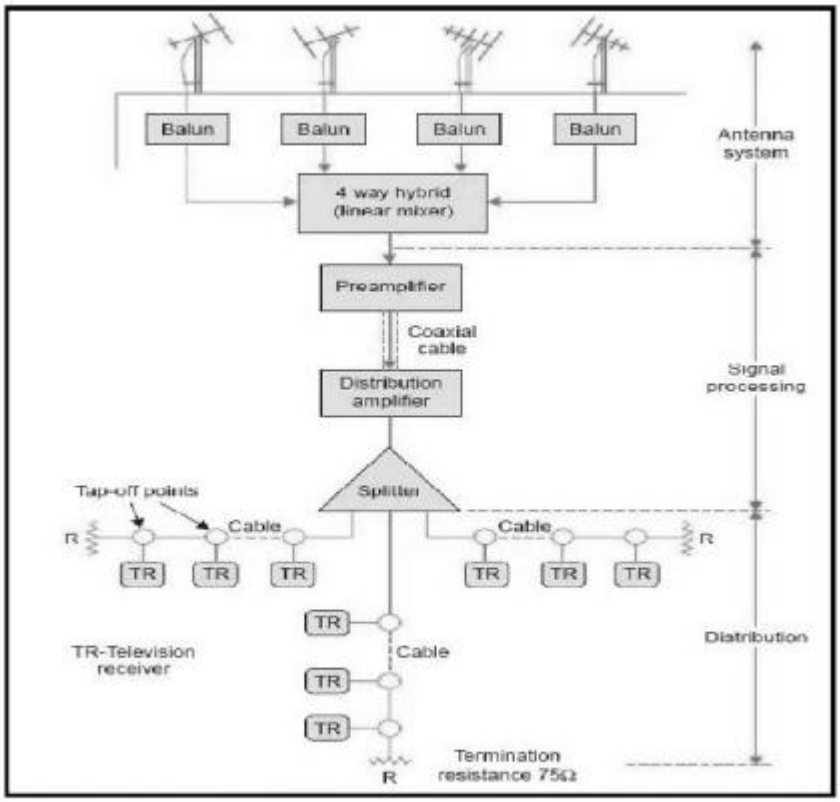
Q.5		Attempt any Two:	16 M
	a)	**Describe the construction and working of PIL picture tube.**	8M
	Ans:	**Explanation:**	4M

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

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

However, because of inward tilt of the right and left guns the blue and red beams travel at an angle and meet the central beam at the aperture grill mask. The slots in the mask are so designed that each beam strikes its own phosphor and is prevented from landing on other colour phosphors.

The P.I.L. tube is more efficient, i.e., has higher electron transparency and needs fewer convergence adjustments on account of the in-line gun structure. It is manufactured with minor variations under different trade names in several countries and is the most used tube in colour receivers.

		Diagram: 	**4M**
b)		**Draw the neat block schematic of MATV system. Describe the function of each block.**	**8M**
Ans:		**Block Diagram:** ***Note: Any other relevant diagram can be considered.***  **Figure: Block diagram of MATV**	**4M**

Explanation:

The block diagram of a basic MATV system is shown in Fig. One or more antennas are usually located on roof top, the number depending on an available telecasts and their direction.

1. Each antenna is properly oriented so that all stations are received simultaneously. In order to allow a convenient match between the coaxial transmission line and components that make up the system, MATV systems are designed to have a 75 Ω impedance. Since most antennas have a 300 Ω impedance, a BALUN is used to convert the impedance to 75 ohms.

2. As shown in the figure, antenna outputs feed into a 4-way hybrid. A hybrid is basically a signal combining linear mixer which provides suitable impedance matches to prevent development of standing waves.

3. The standing waves, if present, result in ghosts appearing in an otherwise good TV picture. The output from the hybrid feeds into a distribution amplifier via a preamplifier.

4. The function of these amplifiers is to raise the signal amplitude to a level which is sufficient to overcome the losses of the distribution system while providing an acceptable signal to every receiver in the system.

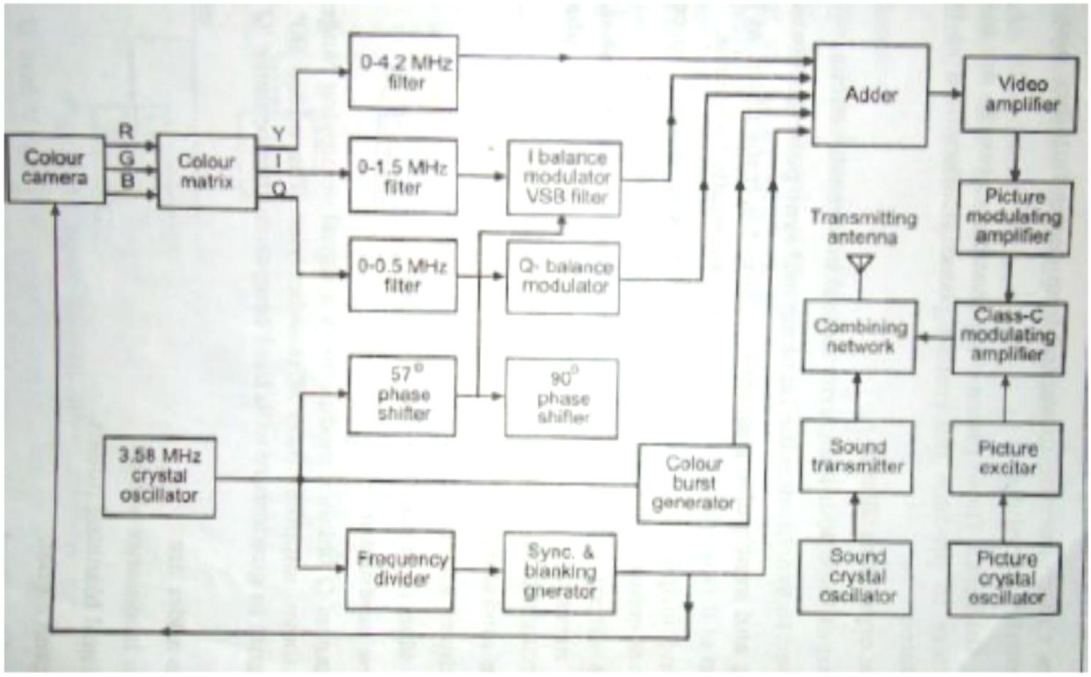
5. The output from the distribution amplifier is fed to splitters through coaxial lines.

4M

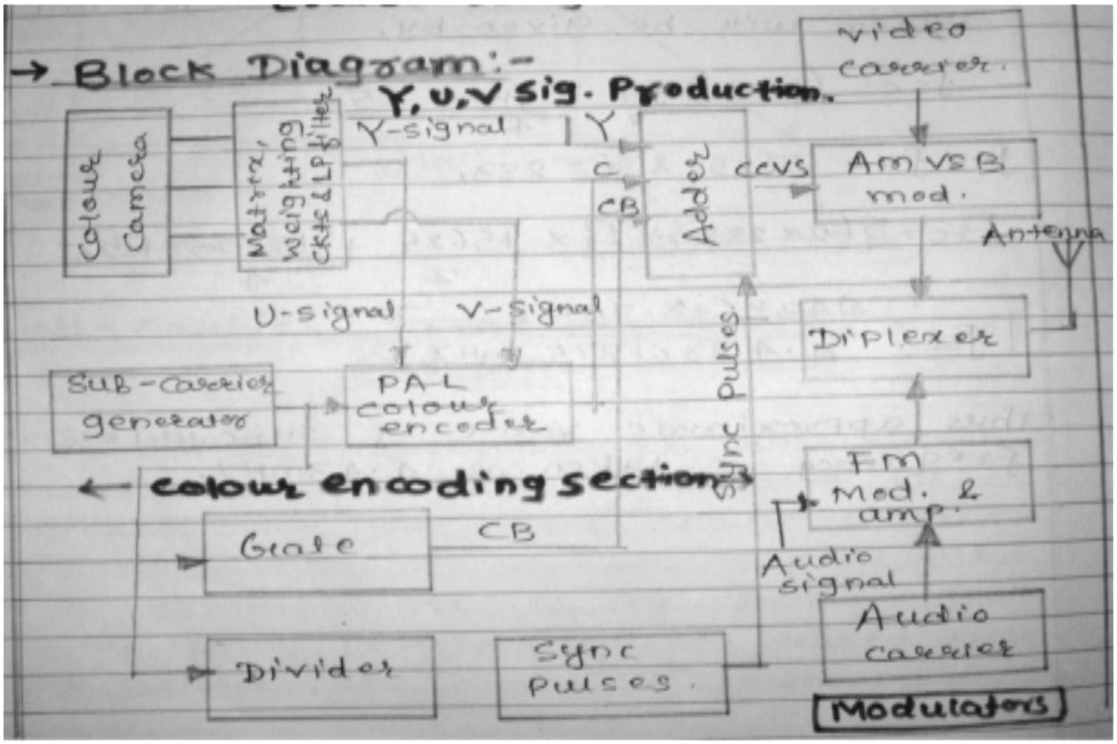
c) **Draw the block diagram of colour TV transmitter. Describe the function of each block.** **8M**

Ans: **Block Diagram:** **4M**

Note:Any other Relevent diagram can be considered



OR



4M

Explanation:-

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

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

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

- Colour camera tube produces R, G and B voltages pertaining to the intensity of red, green and blue colours respectively in pixels. The luminance signal Y is obtained by a resistive matrix, using grassman's law.

Y=0.3R+0.59G+0.11B.

- For colour section Y is inverted colours R&B obtained from the colour camera tubes are added to it to get (R-Y) and (B-Y) colour difference signal. These signals are weighted by two resistive matrix network which gives U & V signals as

U=0.493 (B-Y) & V=0.877(R-Y)

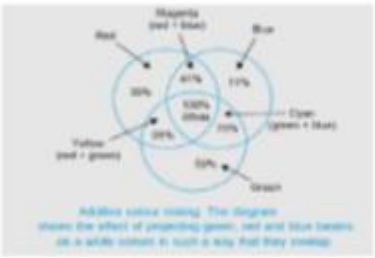
PAL encoder:

- PAL switch which operates electronically at 7812.5Hz with the help of bistable multivibrator and feeds the subcarrier 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 subcarrier signal**. These signals are added vertically to give Chroma signal (C). Then Chroma signal is mixed with Y signal along with sync. And blanking pulses to produce Colour Composite Video Signal (CCVS).

Video and Audio modulators and transmitting antenna:

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

Q.6		Attempt any FOUR:	16 M
	a)	**Compare additive and subtractive colour mixing.**	4 M
	Ans:		1M for each point

PARAMETER	ADDITIVE MIXING	SUBTRACTIVE MIXING
Working Principle	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.
Primaries Used	Different colours are created by mixing pure colours hence used in TV.	Different colours are created by subtracting parts from white so not suitable for TV.
Sketch		
Application	Additives primaries are Red, Green, and Blue.	Subtractive primaries are Magenta, Yellow, and Cyan.

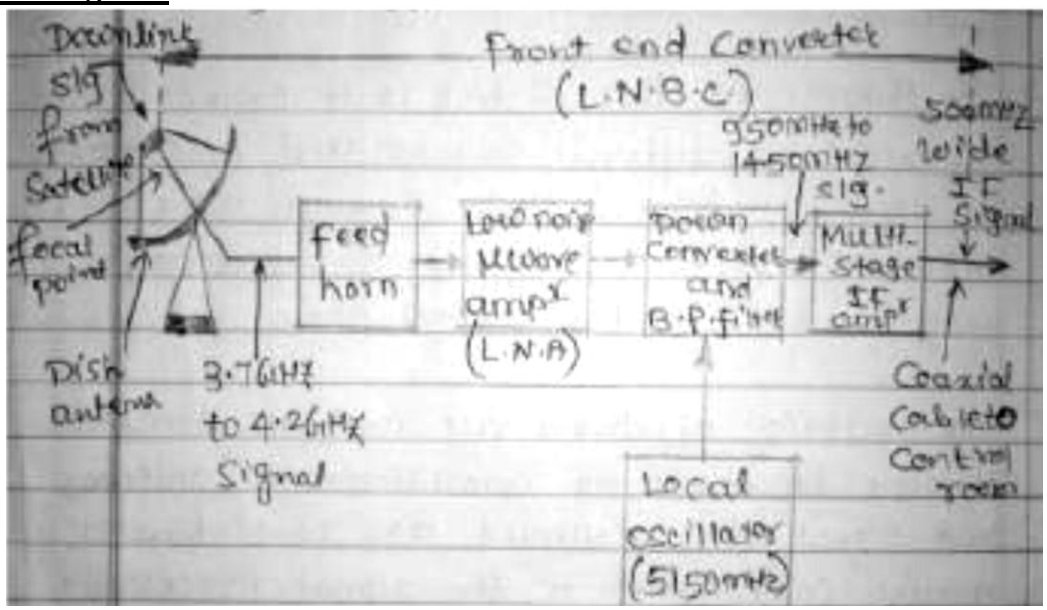
	b)	**List the TV channel allocation for band I and band III.**		4 M
	Ans:			2M FOR BAND 1 2M FOR BAND III

	Ch No.	*Frequency range*	*Picture carrier Frequency (MHz)*	*Sound carrier Frequency (MHz)*
BAND I (41-68 MHz)	1	41–47 (not used)		
	2	47–54	48.25	53.75
	3	54–61	55.25	60.75
	4	61–68	62.25	67.75
BAND III (174-230 MHz)	5	174–181	175.25	180.75
	6	181–188	182.25	187.75
	7	188–195	189.25	194.75
	8	195–202	196.25	201.75

9	202–209	203.25	208.75
10	209–216	210.25	215.75
11	216–223	217.25	222.75
12	223–230	224.25	229.75

c) **Describe the working of LNBC with the help of block diagram.** **4 M**

Ans: **Block Diagram:** **2M**



2M

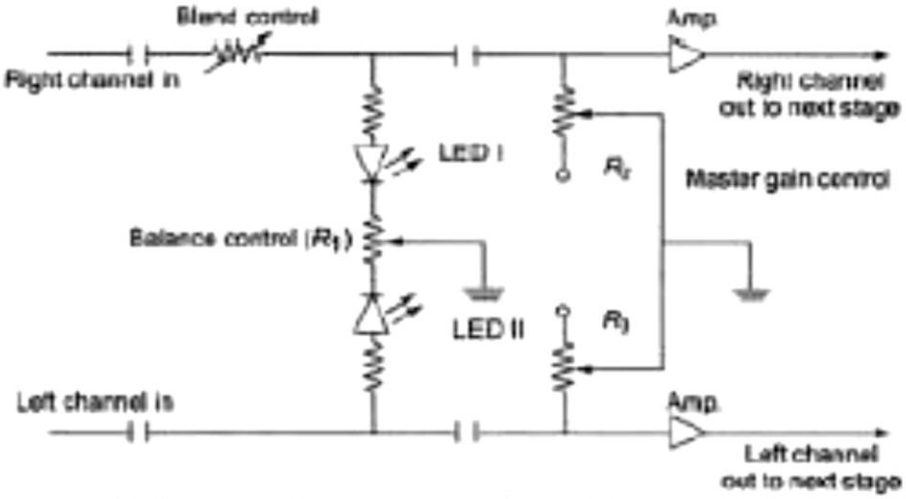
Explanation:-

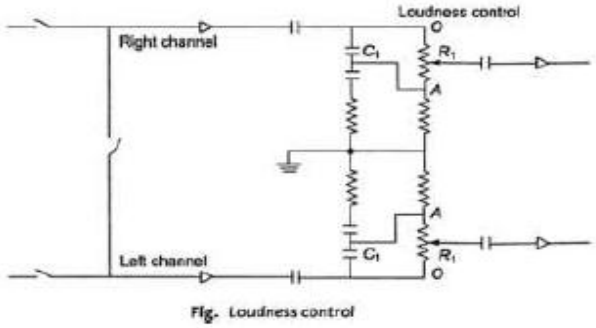
This unit is mounted on the dish antenna to reduce the signal attenuation and noise interference. The function of LNBC unit is to convert the signals received from the satellite in the range of GHz to an IF of 500 MHz.

This 500 MHz is then given to the satellite receiver to demodulate the signal. The block diagram is as shown.

- **Feed horn:** it is placed in front of dish antenna. It is used to catch the signals coming from dish antenna and to transfer it to LNA.
- **Low noise amplifier:** It is used to provide sufficient signal to drive the down converter. The gain requirement for this LNA is 500.
- **Down converters:** The output signal from LNA is converted to lower frequency of 500 MHz. It is required to avoid losses taking place in long coaxial cable.
- **IF amplifier:** The center frequency of down converter is called IF frequency. It is used to amplify the signals coming from down converter.

2M

	d)	a) **Describe the functions of following in Hi-Fi amplifier:** i) **Balance control** ii) **Loudness control** iii) **Bass and treble control** iv) **Balance control**	**4 M**
	Ans:	**Balance Control:** • Two amplifiers of a stereo system, although independent of each other, are built as matched pair to give equal output for the same input. In spite of the two amplifiers being identical, there may be variations in the output of each channel due to variations in the characteristics of transistors & ICs and positioning of loudspeaker & furnishing with respect to the listener. The circuit used is called *BALANCE CONTROL*. • A simple circuit is shown in fig. The balance control is a potentiometer. When it is set in the center, the current through LED1 & LED2 should be identical, if the signals in the left & right channels are equal. In that case both LED will be equally bright. • In case of any inequality, the two brightness level will also become unequal. When balance control is moved down, the output of the left channel will increase while that of right one will decrease, and vice-versa when moved up.  Balance control, master gain control and blend control **Quasi Stereo Switch:** • When any one channel signal is made to go into both the channels, one can use both channels & their speakers for monophonic source of signal. This is done by a switch called quasi-stereo switch. **Bass & Treble Control:** • It is provided to tailor bass & treble as per personal taste of listener. **Loudness Control:**	**1 M FOR Each Definition.**

		• Sometimes music is at low level of volume. At low levels there is considerable loss in bass in reproduction. It is, therefore necessary that there should be substantial boosting of bass at low levels. Boosting at treble may be only nominal because loss at high notes is quite small. The control which provides desired boosting at bass & at treble is called *LOUDNESS CONTROL*. • It boost audio by +12dB at 50Hz & +3dB at 10 KHz. The loudness control should be used only when sound level is low.  Fig. Loudness control **Figure: Loudness control**	
	e)	**Describe vertical resolution and horizontal resolution in brief.**	**4M**
	Ans:	The scanning and reproduction of finest details of the picture is known as the resolution of a system. **Vertical resolution:** The ability of a scanning system to resolve vertical details in a scene depends upon the number of horizontal scanning lines used per frame. The maximum number of dark and white elements which can be resolved by human ye in vertical direction in a screen of height H is decided by number of horizontal lines into which the picture is split while scanning. **The vertical resolution = 0.7*585 = 409.5 lines** **Horizontal resolution:** It is the ability of scanning system to resolve horizontal details i.e. changes in brightness levels of elements along a horizontal scanning line.	**2 M for each Definition**