WINTER-19 EXAMINATION

Subject Name: Audio Video Engineering **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 themodel answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may tryto assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given moreImportance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in thefigure. The figures drawn by candidate and model answer may vary. The examiner may give credit for anyequivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constantvalues 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.

<table>
<tr><th>Q. No.</th><th>Sub Q. N.</th><th>Answers</th><th>Marking Scheme</th></tr>
<tr><td>1</td><td>(A)</td><td>Attempt any THREE of the following:</td><td>12- Total Marks</td></tr>
<tr><td></td><td>(a)</td><td>Differentiate between stereo amplifier and mono amplifier. (4 Points)</td><td>4M</td></tr>
<tr><td></td><td>Ans:</td><td>
<table>
<tr><th></th><th>Mono</th><th>Stereo</th></tr>
<tr><td>Stands for</td><td>Monaural or monophonic sound</td><td>Stereophonic sound</td></tr>
<tr><td>Key feature</td><td>Audio signals are routed through a single channel</td><td>Audio signals are routed through 2 or more channels to simulate depth/direction perception, like in the real world.</td></tr>
<tr><td>Recording</td><td>Easy to record, requires only basic equipment</td><td>Requires technical knowledge and skill to record, apart from equipment. It's important know the relative position of the objects and events.</td></tr>
</table>
</td><td>1M Each Point</td></tr>
</table>

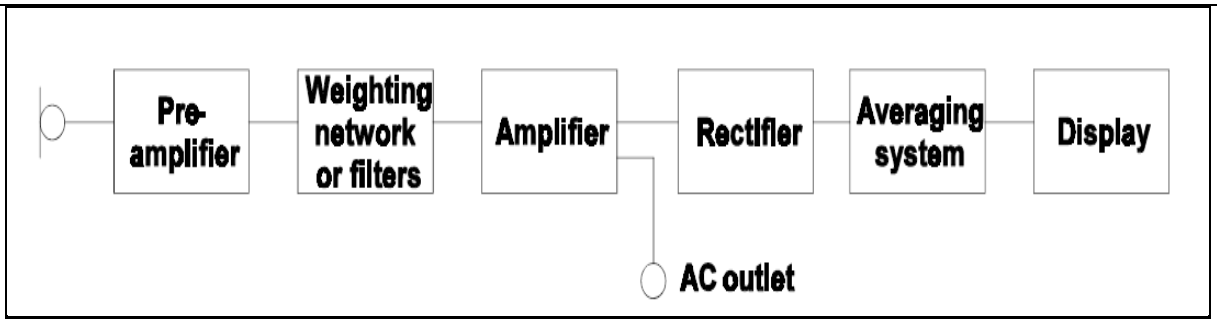
		Cost	Less expensive for recording and reproduction	More expensive for recording and reproduction	
		Circuit Complexity	Less Complex then	More Complex	
		Usage	Public address system, radio talk shows, hearing aid, telephone and mobile communication, some AM radio stations	Movies, Television, Music players, FM 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)	**Draw block dia of dB meter. State function of each block.**			**4M**
	Ans:				**2M Diagram , 2M Explanation**

Figure: Block diagram of dB Meter

- The electrical signal from the transducer is fed to the pre-amplifier of the sound level meter and, if needed, a weighted filter over a specified range of frequencies.
- Further amplification prepares the signal either for output to other instruments such as a tape recorder or for rectification and direct reading on the meter.
- The rectifier gives the RMS value of the signal. The RMS signal is then exponentially averaged using a time constant of 0.1 s ("FAST") or 1 s ("SLOW") and the result is displayed digitally or on an analog meter.
- In some cases, the sound level meter does not include a logarithmic converter. The scale on the indicating device is then exponential so that the linear signal may be

read in dB.

- In this case, the dynamic range of the display is usually restricted to 10 to 16 dB and the precision of the reading is rather poor. In the case of intermittent noise, the user must constantly adjust the amplifier to adapt the output signal to the dynamic range of the display.
- When a log converter is used, the display scale is linear in dB and its dynamic range is usually much greater. This type of display has the advantage of providing the same precision at any level and permitting a much better appreciation of the range of fluctuations of the noise to be measured. In this regard, digital displays are less useful.

OR

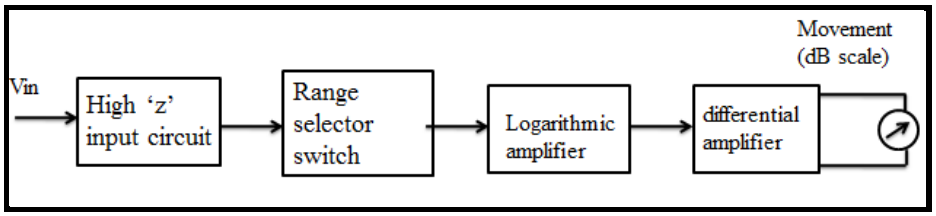


Figure: Block diagram of dB meter

Working:

- The RF signal to be measured is connected to the input of high impedance input circuit through a RF connector, whose input impedance is 75 Ω. The range selector switch selects the band and range of its frequencies to be tuned.
- The logarithmic amplifier is connected to the differential amplified whose signal output deflects the dB scale in the dB meter. To obtain logarithmic characteristics, the meter use a diode in feedback loop of an op-amp. dB is the unit for losses and gains.

	(c)	**Define following terms with respect to TV system.** **(1) Compatibility (2) Viewing distance** **(3)Aspect ratio (4) Hue**	**4M**
	Ans:	**(1) Compatibility:** The colour television signal must produce a normal black and white picture on a monochrome receiver without any modification of the receiver circuitry. **(2) Viewing distance:** The viewing distance from the screen of the TV receiver should not be so large that the eye cannot resolve details of the picture. The distance should also not be so small that picture elements become separately visible. The above conditions are met when the vertical picture size subtends an angle of approximately 15° at the eye. The distance also depends on habit, varies from person to person, and	**1M each Definitio n.**

		lies between 3 to 8 times the picture heights. Most people prefer a distance close to five times the picture height. **(3) Aspect ratio:** The aspect ratio of an image describes the proportional relationship between its width and its height. The frame adopted in all television systems is rectangular with width/height ratio, i.e., aspect ratio = 4/3. **(4) Hue:** 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.	
	(d)	**Describe the function of Remote control transmitter and receiver unit used in CD player.**	**4M**
	Ans:	Function of remote control transmitter and receiver unit used in CD player: Transmitter: Play: To play the track, song etc. Reset: to set the settings to default. Manual Search Keys: To search the track or file from the CD Automatic Music Search Keys: Select music. Repeat Program Button: To repeat the program Clear: to clear the Playlist Music select: Select the Music from List of song. Receiver: Top Load player: To insert CD On/ Off: To power ON/ OFF	**2M remote control transmitter and 2M receiver**

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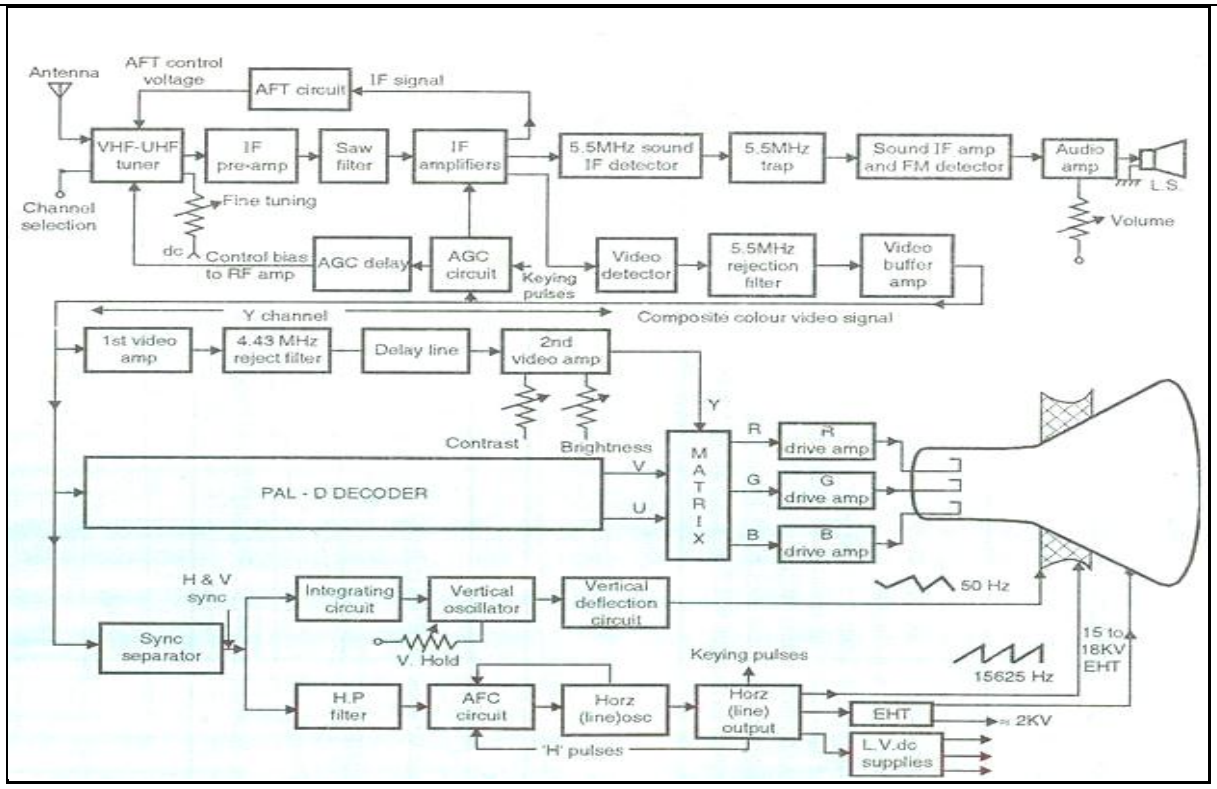
		Play: To run the selected Music. Pause: To Pause the Sound Stop: To terminae/ Clear Song playlist.	
	(B)	**Attempt any ONE of the following :**	**6M**
	(a)	**Draw block dia of colour TV receiver**	**6M**
	Ans:		**6M DIAGRAM**
	(b)	**Draw block dia of PAL – D decoder.**	**6M**

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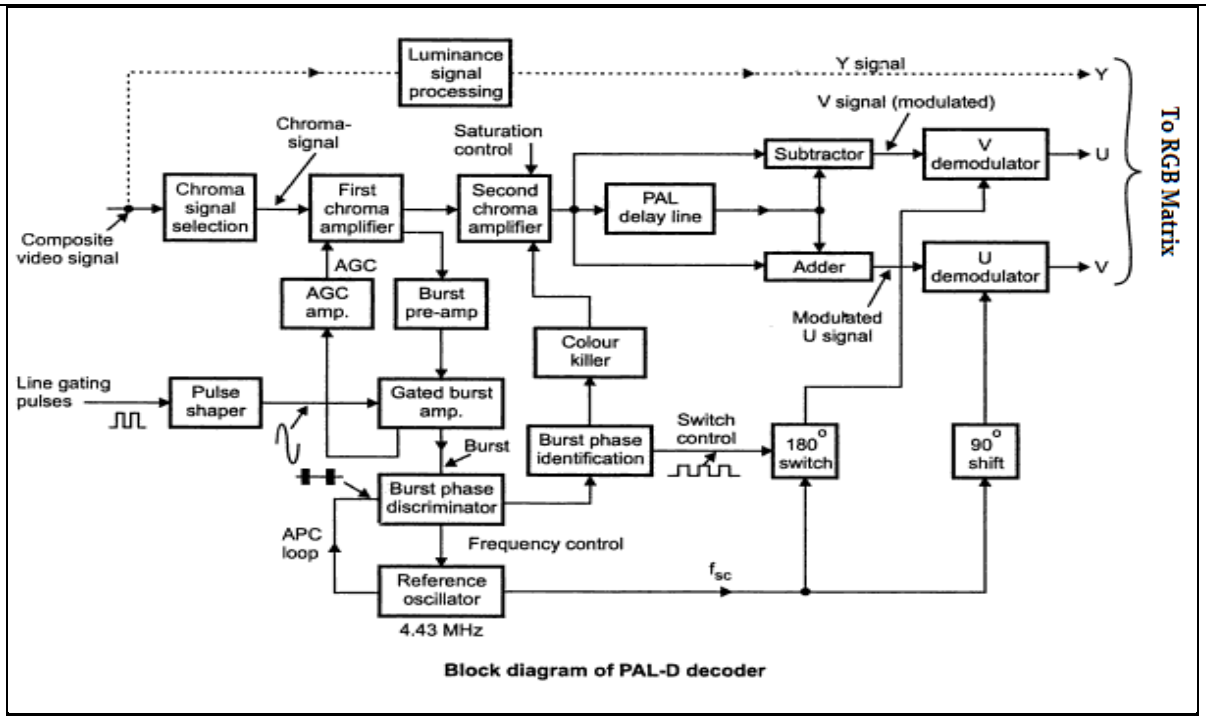
	Ans:	 Block diagram of PAL-D decoder	**6M Diagram .**

Q. No.	Sub Q. N.	Answers	Marking Scheme
2		**Attempt any FOUR of the following :**	**16- Total Marks**
	a)	**Draw neat sketch of yagi uda antenna. Write function of each component.**	**4M**

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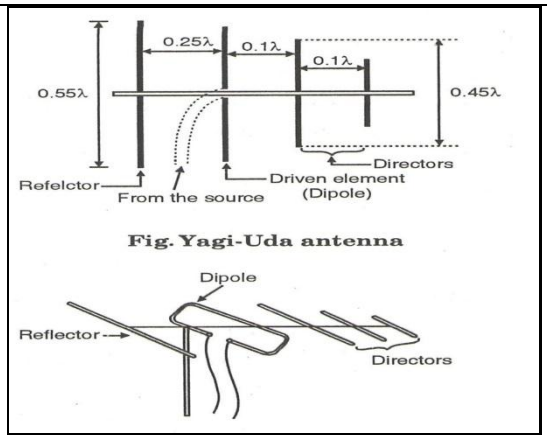
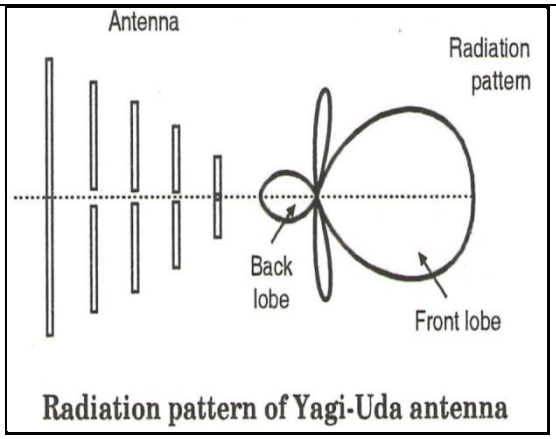
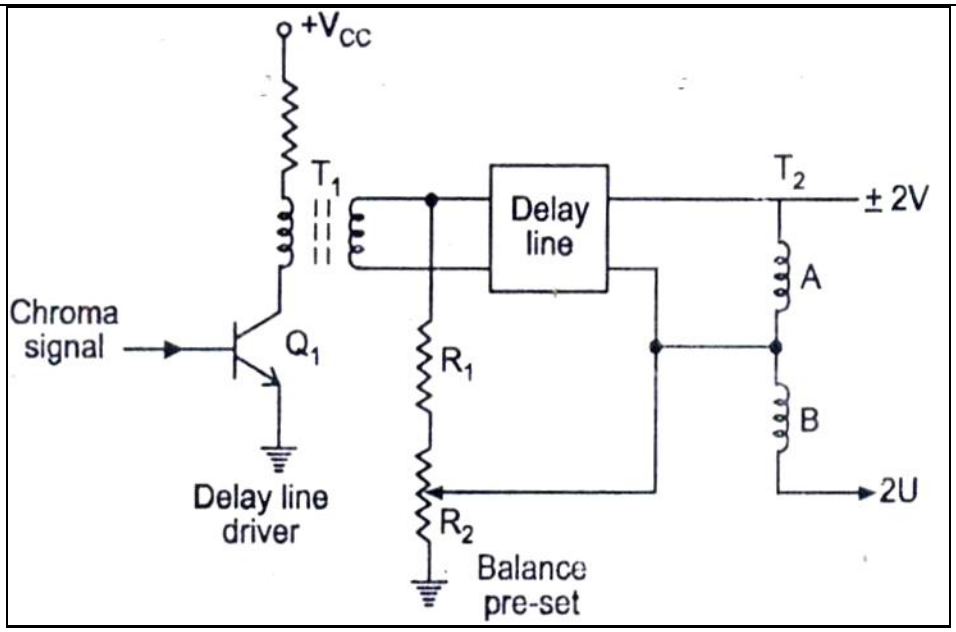
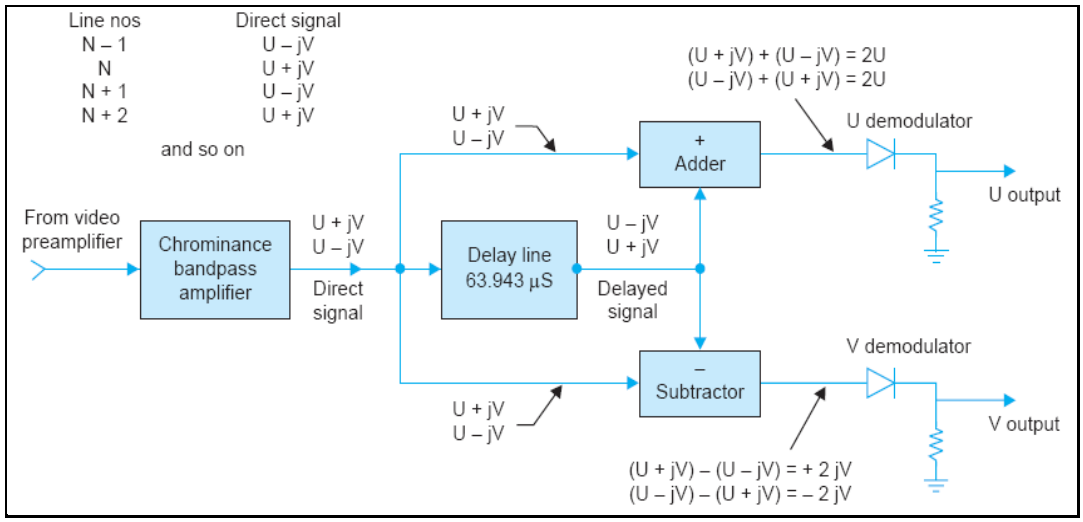
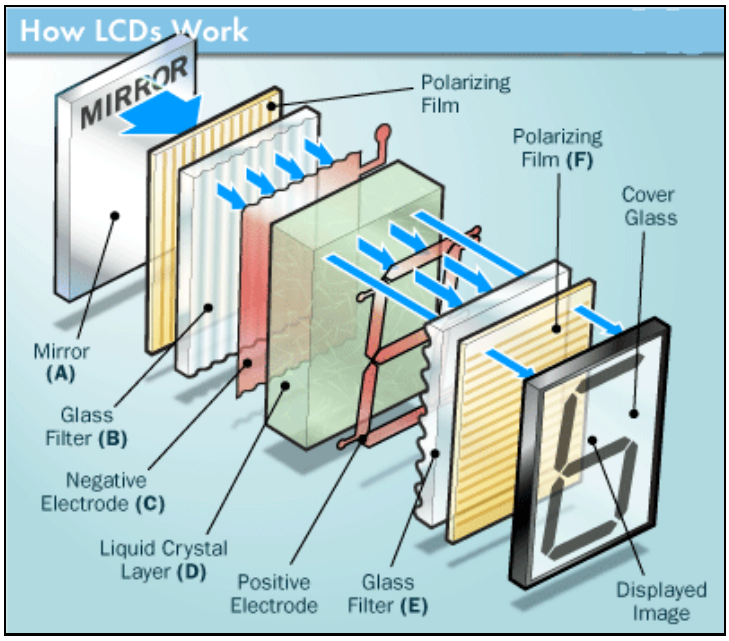
	Ans:	 **Fig. Yagi-Uda antenna**  **Radiation pattern of Yagi-Uda antenna** **Figure: a) Construction details of Yagi uda antenna (b) Radiation Pattern** The elements of its array are as shown in fig. (a) And is relatively unidirectional as seen from its radiation pattern drawn in fig. (b) ***Function of reflector:*** The reflector rod is longer in length by about 10% of the length of dipole. The dipole is 0.5λ and reflector is 0.55λ. Reflector acts as s tuned circuit whose resonant frequency is lower than the frequency of the signal being received by the active dipole element. ***Function of director:*** Director concentrates the energy in the same direction in which the radio wave is moving. The director rod is shorter than the dipole by about 10% of the length of dipole. It collects the maximum signal strengths. So the number of directors is more than one. Director face towards transmitting antenna. ***Function Dipole:*** Collects all signal strength from directors and fed to TV receiver through \Parallel wire.	**2M Diagram , 2M Explanation**
	b)	**List the frequencies of TV channel allocation for band I & 6 and III.**	**4M**
	Ans:		**2M for Band I & 2M for Band III.**

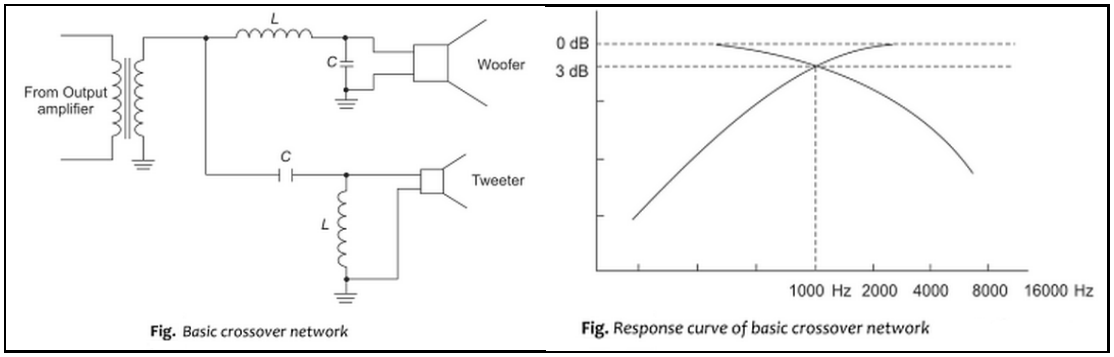
	Ch No.	*Frequency range*	*Picture carrier Frequency (MHz)*	*Sound carrier Frequency (MHz)*
BAND I (41-68 MHz)	1	41–47 (not used)		
	2	47–54	48.25	53.75

			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)	**Explain separation U and V signals in colour TV with neat diagram.**					**4M**

	Ans:	 **Figure: Separation of U & V Signal** **OR**  **Figure: Block Diagram of Separation of U & V Signals** • 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.	**2M DIAGRAM, 2M EXPLANATION**

		• 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 below.	
	d)	**List different drive motors used in CD player. Write function of any one motor.**	**4M**
	Ans:	• The drive motors in CD players are used for various purposes such as for loading and unloading CD from tray, for rotating CD, for rotating laser beam etc. The motor circuit consists of transistor or IC components within the drive components are controlled by a PLL and servo processor. Different types of motors used in CD players are: • Tray loading or carriage motor, • Slide sled feed motor and • Spindle, disc, turn table motor. • There are three basic motors used in the CD player.CD players with auto CD changer or the table top changer may have up to five different motors or some portable or combination CD and cassette player may have only two motors but three motors used In CD players are most common. • The **tray or loading motor** moves the CD tray in and out for loading and unloading the CD when the open/close switch is pressed. • A **disc, spindle or turntable motor** rotates the CD at a variable speed. The disc motor rotates faster at the beginning and slows down as the laser assembly moves toward the outer edge of the CD. The **slide, feed or sled motor** moves the optical pickup unit from the center to the outer edge of the disc on sliding rods. Some players have a pick-up motor that travels in a radial or semicircle fashion.	**1m Listing** **3M function of motor(1 M each, every motor)**
	e)	**State working principle of LCD TV with neat dia.**	**4M**
	Ans:	• *The main principle behind liquid crystal molecules is that when an electric current is applied to them, they tend to untwist. This causes a change in the light angle passing through them. This causes a change in the angle of the top polarizing filter with respect to it. So little light is allowed to pass through that particular area of LCD. Thus that area becomes darker comparing to others.* • Because the light source is a bulb at the back of the screen, rather than light-emitting	**2M Diagram , 2M Explanation**

		phosphors at the front of the screen, this technology is referred to as 'transmissive'.  **Figure: Construction of LCD** ***LCD Screen On*** • If an electrical current is applied to the liquid crystal, it will untwist, effectively blocking out the light. Different strengths of current result in more or less of the light being blocked, so different shades of light become possible. ***LCD Screen Off*** • If this principle is multiplied many times you get a basic LCD screen. Early applications used a 'passive matrix' display, where a grid of conductors lies alongside the LCD pixels. • This allows individual pixels to be switched on and off, but also introduced blurring to the image because some electrical current would find its way into neighboring pixels.	
	f)	**Draw two way cross – overs n/w & its response curve.**	**4M**
	Ans:	• 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 absence of crossover network, the speaker will suffer overheating & the output will be distorted when full power at frequencies outside their range is fed to them. The efficiency will	**2M Diagram , 2M explanat**

		be much reduced in absence of crossover network. • Crossover network make use of the fact that • The capacitive reactance decreases with increase in frequency [Xc = 1/ (2πfC)], • The inductive reactance increases with increase in frequency [XL = 2πfL]. • A basic crossover network is shown in fig. below; the circuit consists of a low-pass LC filter across the woofer & a high pass LC filter across the tweeter. The LPF permits only low audio frequencies (16Hz – 1 kHz) to go to the woofer. The series reactance of L & shunt reactance of C for high audio frequencies prevents these frequencies from going to the woofer. • The HPF consisting of series C & shunt L that allows the high audio frequencies to pass to tweeter & blocks the low frequencies. • The response of typical crossover network is shown below.  Fig. *Basic crossover network* Fig. *Response curve of basic crossover network* **Figure: Two way crossover network** • A commercial three way crossover network is shown below the circuit consists of a low-pass L filter in series with the woofer & a high pass C filter is in series with the tweeter. The LPF permits only low audio frequencies (16Hz – 500 Hz) to go to the woofer. The mid-range frequencies are obtained either by connecting two inductors in shunt, or by connecting series L & C before the mid-range squawker. The fig. shows the three way crossover network & its response over the audio range. • For the three way crossover network frequency coverage for the crossover point is given below:	**ion**

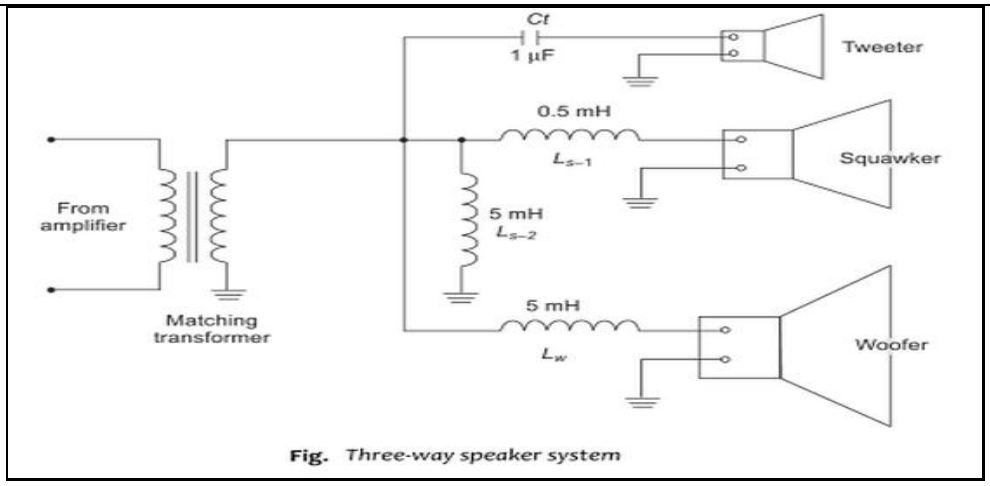


Fig. *Three-way speaker system*

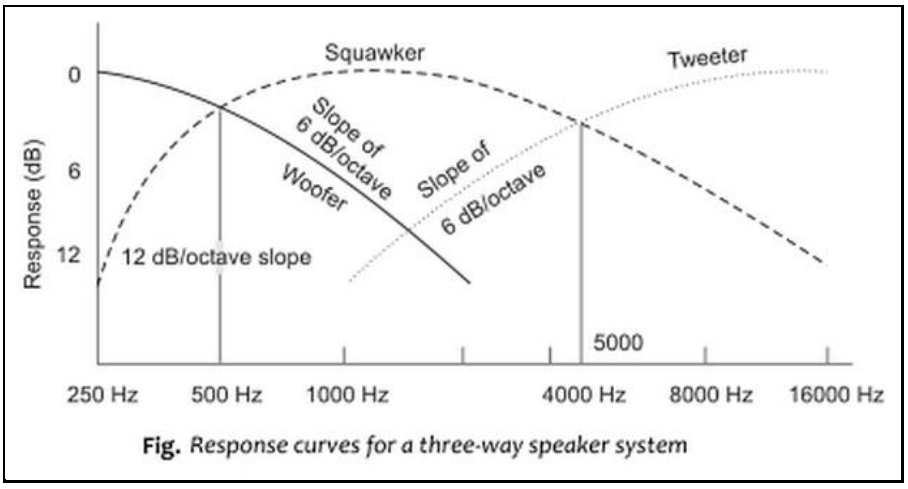
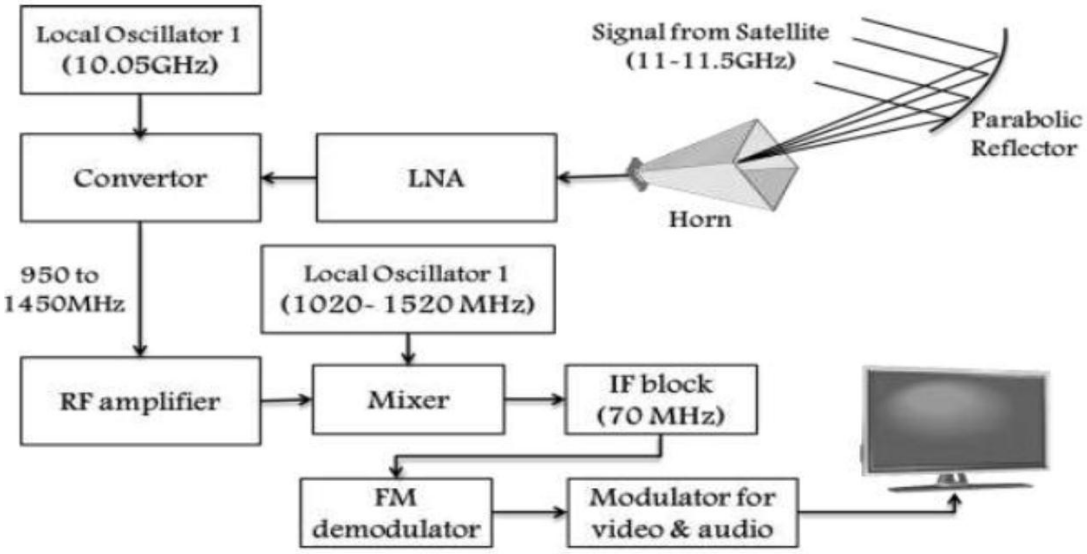


Fig. *Response curves for a three-way speaker system*

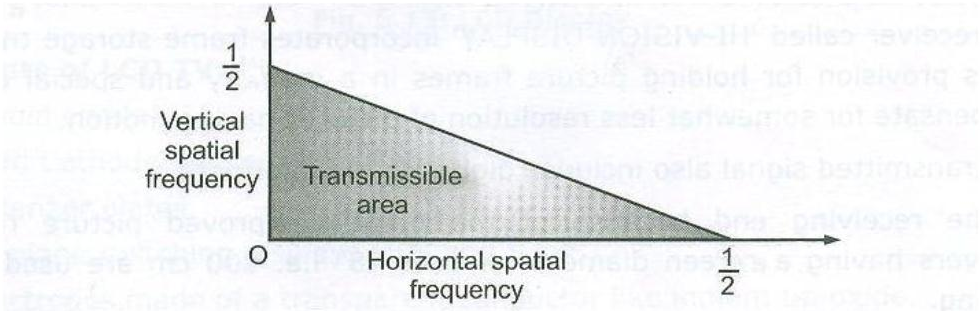
Figure: Three way crossover network

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

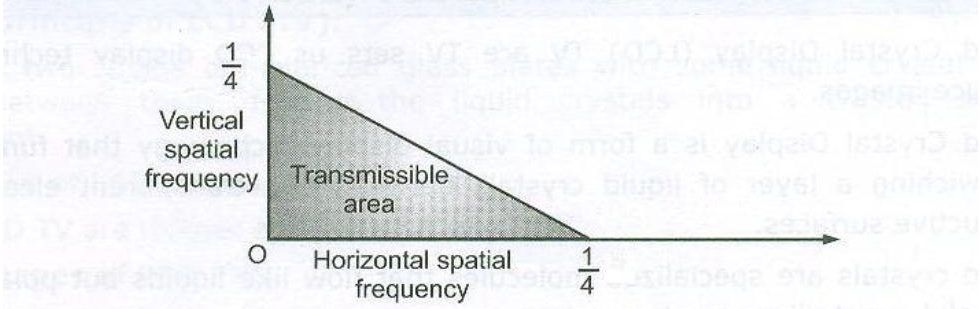
Q. No.	Sub Q. N.	Answers	Marking Scheme
3		**Attempt any FOUR of the following :**	**16- Total Marks**

	(a)	**Draw block dia of DTH system. Write function of each block.**	**4M**
	Ans:	 **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:** • It consist of converter RF amplifier, mixer, IF modulator, modulator for audio and video • The wideband signal from LNB is fed to an RF amplifier. The amplified signal is fed to the channel selector circuits which selects the wanted band. • The selected channel is down converted to a fixed IF of 70 MHz by local oscillator and mixer. • IF amplifier amplifies the signal which is then goes to FM detector.	**Block diagram : 2M** **Function : 2M**

		• The detector recovers the 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 and sound.	
	(b)	**Describe NHK MUSF system for HDTV.**	**4M**
	Ans:	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. For a moving picture area the final picture is reconstructed by spatial interpolation using samples from a single field. Hence moving portions 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. 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 : 2M** **Explanation :2M**



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



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

	(c)	**List controls available on Hi-Fi amplifier. Explain any two.**	**4M**
	Ans:	▪ **Balance control** ▪ **Master Gain Control** ▪ **Blend Control** ▪ **Quasi Stereo Switch** ▪ **Loudness control** ▪ **Bass and treble control** **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.	**List : 2M** **Explanation : 2M (any two)**

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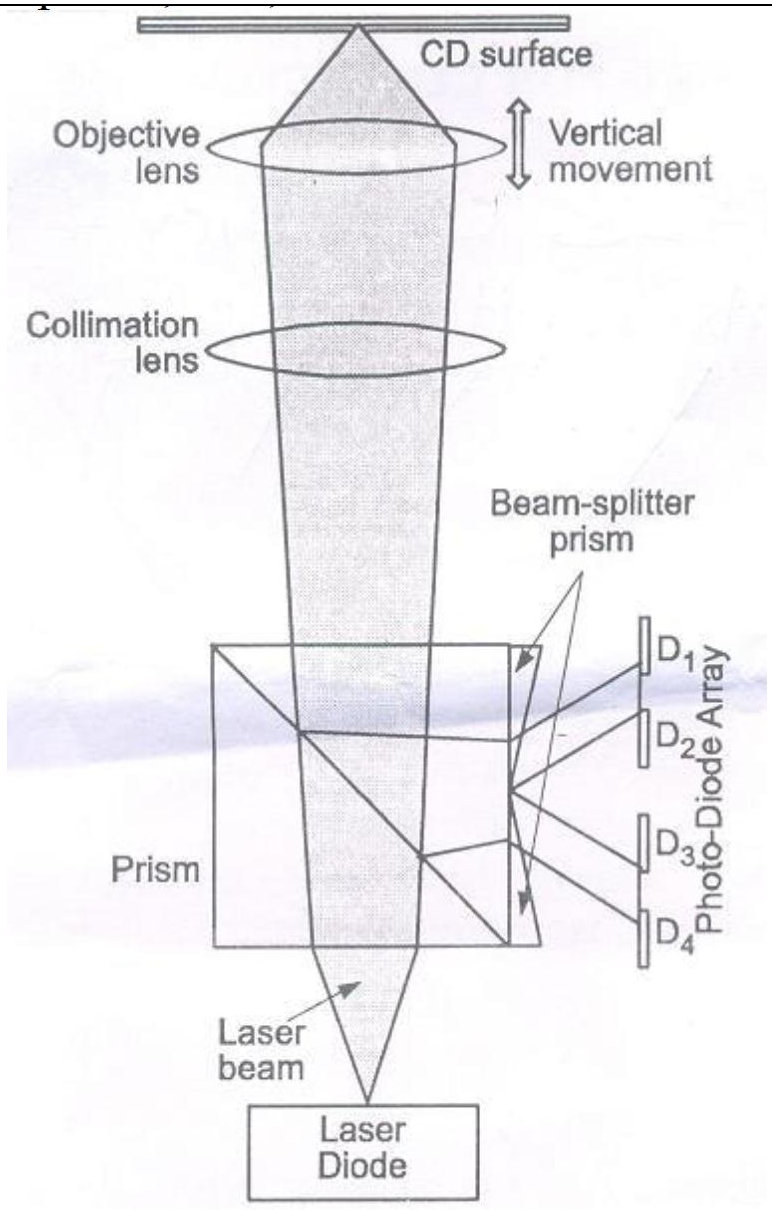
		Master Gain Control: A master gain control is used for adjusting overall volume without disturbing the balance. This is achieved by using dual concentric shafts, the inner shaft adjusts the balance control & the outer shaft, the overall gain or volume of the amplifier. A typical master gain control circuit is shown above. R1 is adjusted for balancing two channels & then R2 & R3 are adjusted for increasing or decreasing the volume of the channels. R2 & R3 are ganged. **Blend Control:** The stereo effect is diluted by this control when there is too much left-right effect. Diluting is done by misbalancing the two channels. It is shown in fig. above; blend control potentiometer is set at zero resistance for balanced output. For disturbing the balance, this is advanced further to reduce gain of the left channel. Although blending can be done by balance control also, but once set, the balance control is not disturbed. **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:** 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.	
	(d)	**Draw and explain CD pick – up assembly in CD player.**	**4M**

	Ans:	 In Optical Pick up Unit,the laser diode emits laser beam from a small point into 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 centre of the track. beam focused on the CD and to keep the condensed beam at the centre of the track. This reflected beam is applied to a group of photo-diodes through objectives lens, collimator lens and some prism arrangement. These photo-diodes induce voltage according to the reflected beam falling on it. Focus error and tracking error voltage generated by this photo-diode array is applied to the tracking and focusing coil to control the objective lens and data	**Diagram : 2M** **Explanation: 2M**

		signal generated by this photo-diode 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. OR 1)A low power laser diode to illuminate the CD tracks. 2)Lens and prism arrangement to direct the laser beam to the CD surface and to direct the reflected laser beam towards photodiode array. 3) A photo diode 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. Optical arrangement in a single-beam radial tracking pick-up assembly: 4)In the optical pick-up 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. 5) 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. 6) 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. 7) These photo-diodes induce voltage according to the reflected beam falling on it. Focus error and tracking error voltage generated by this photo-diode 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 amplifieris processed to produce the audio signal stored on the disc surface	
	(e)	**List any eight CCIR-B standards for colour TV.**	**4M**
	Ans:	Parameters CCIR B standard 1. Number of scanning lines/frame 625 2. Field (vertical) frequency 50Hz 3. Line(horizontal) frequency 15625Hz 4. Aspect ratio(width/height) 4:3 5. Horizontal trace time 52µs 6. Horizontal retrace time 12µs	**4M (any eight)**

		7. Total scanning line lost in vertical retrace 64µs 8. Front porch 1.5µs 9. Back porch 5.8µs 10. Horizontal sync pulse 4.7µs 11. Colour sub carrier frequency 4.43MHz 12. Colour system Phase Alteration by Line –Delay (PAL-D) 13. U signal(weighted B-Y) U=0.493 (B-Y) 14. V signal(weighted R-Y) V=0.877(R-Y) 15. Total vertical blanking duration 1280µs or 1.280ms 16. Vertical sync pulse 160µs 17. Pre and post equalizing pulse 5 pulse each 18. Sync pulse top 100% 19. Blanking/pedestal level 75% 20. Black level 72-75% 21. White level 10-12.5% 22. Width of video signal 5MHz 23. Chroma signal bandwidth -1.3MHz to +1.57MHz 24. Video IF 38.9MHz 25. Audio IF 33.4MHz 26. Inter carrier frequency 5.5MHz 27. Audio modulation Frequency Modulation(FM) Video modulation Amplitude Modulation (AM) Total channel width in VHF 7MHz 28. Total channel width in UHF 8MHz	

Q. No.	Sub Q. N.	Answers	Marking Scheme
4.	**(A)**	**Attempt any THREE of the following:**	**12- Total Marks**
	a)	**Compare additive colour mixing and subtractive colour mixing. (any 4 points)**	**4M**
	Ans:		**4M (any fur pints)**

Additive colour mixing	**subtractive colour mixing**
1. Additive mixing of three primary colours red, green and blue with proper	1. In subtracting mixing reflecting properties of pigments are used which absorb all wavelengths but for their

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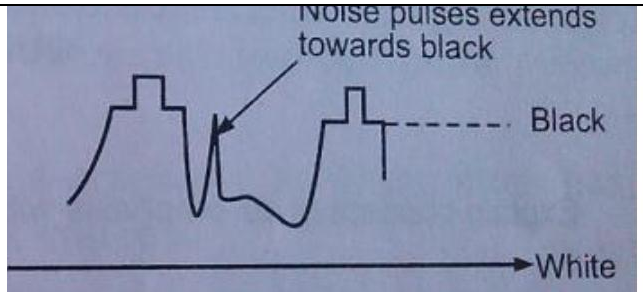
		proportions can create any colour	characteristics colour wavelengths	
		2. Different colours are created by mixing pure colours hence used in TV.	2. Different colourscreated by subtracting parts from white so not suitable for TV	
		3. For example, Red + Blue = Magneta Red + Green = Yellow Green + Blue = Cyan	3. For example, Red + Blue = Magneta Red + Green = Yellow Green + Blue = Cyan	
		4. Additives primaries are Red, Green, Blue	4. Subtractive primaries are Magneta, Yellow, Cyan.	
	b)	**List merits and demerits of negative amplitude modulation in TV.**		**4M**
	Ans:	Merits of Negative Modulation: 1) Effect of noise interference on picture signal: - When the noise gets added in the form of pulse to carrier amplitude, it increases carrier amplitude. In of Negative Modulation, noise pulse goes towards black level and produces black spot which is less noticeable against gray background. 2) Saving of power at transmitter side: - In of Negative Modulation picture having high brightness level produces less modulation of carrier which saves the transmitting power. 3) Reference level for AGC circuit in receiver: - AGC circuits in receiver measures peak level of modulated signal and accordingly adjusts the gain of IF and RF amplifier. - In Negative Modulation, peak level is at 100% which is sync level and it is stable. Whereas in of Positive Modulation, peak level is not stable. Hence Negative Modulation is used in AGC circuit. Demerits of Negative Modulation 1) Effect of noise interference on synchronization: - In Negative Modulation, sync pulses are at blacker than black level. If noise arises, then it also comes in black level which causes synchronization trouble. Hence horizontal stabilizing circuits must be used.	**Merits: 2M** **Demerits :2M**



OR

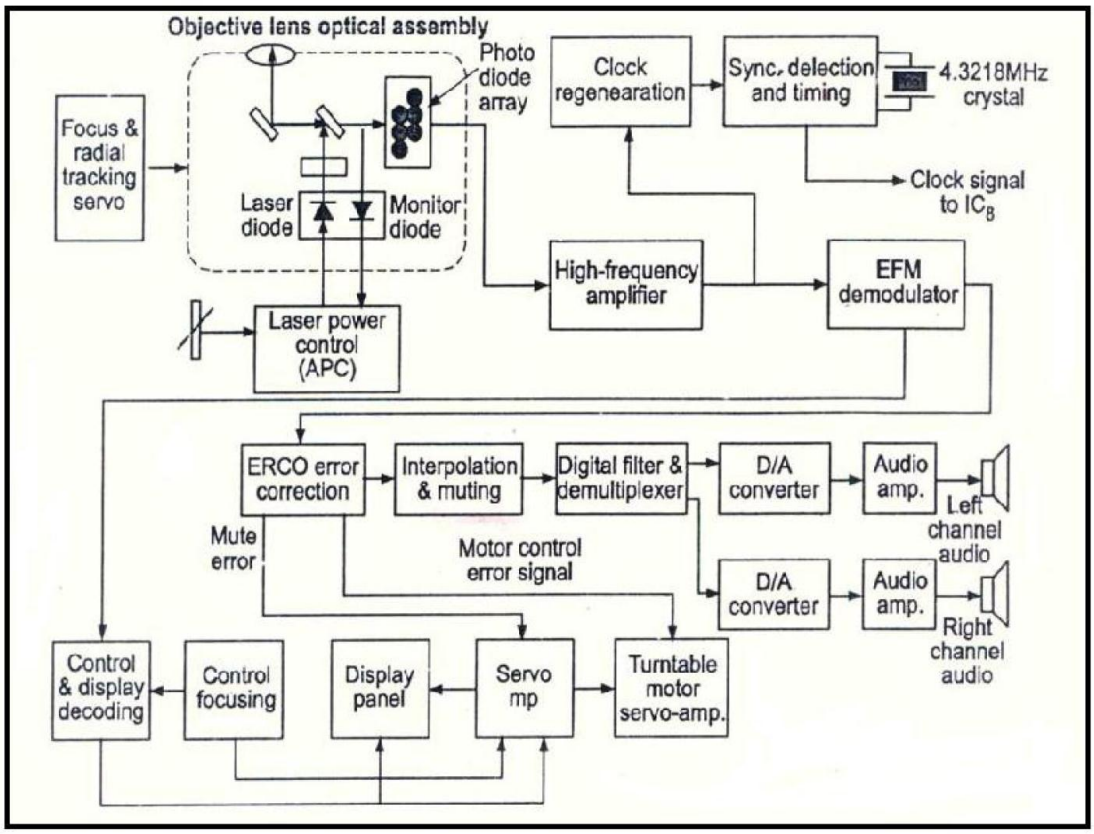
Merits of Negative Modulation:

- Lesser noise interference on picture signal.
- Possible to obtain larger peak power output.
- Less picture signal distortion.
- Easy to develop true AGC voltage.
- More efficient operation.
- More power available from the transmitter
- Saving in transmission power

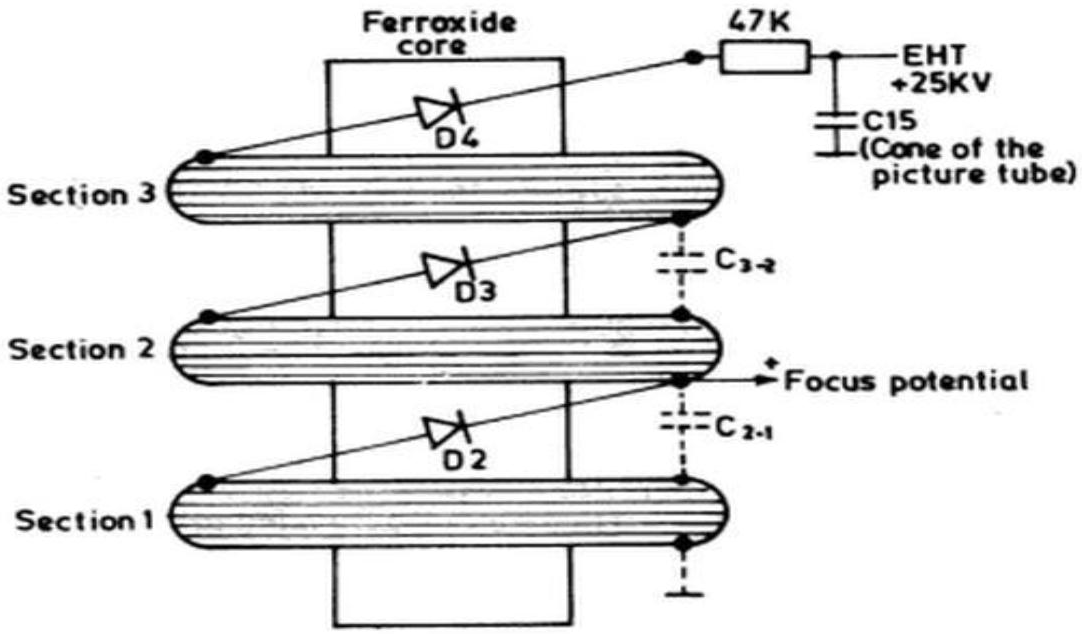
Demerits of Negative Modulation:

- The synchronization of the receiver is affected by spurious random pulses produced due to the effect of noise.
- The loss of horizontal and vertical synchronization may cause diagonal or vertical rolling of picture.

	c)	**Draw block dia of CD player.**	**4M**

	Ans:	 **Figure: Block diagram of CD player**	**4M**
	d)	**Compare CATV and CCTV (4 points)**	**4M**
	Ans:		**Any four points : 4M**

Cable Television (CATV)	**Closed Circuit Television(CCTV)**
The CATV monitor has RF, IF as well as detector stages.	CCTV monitors does not have RF, IF and detector stages
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.

		Various channels such as scientific, geographic, sports news, entertainment etc. are provided by CATV	Such channels are not provided in CCTV.	
		CATV service provider can broadcast live programs from studios, some events etc. on their local TV channels	Such facilities are not available	
		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 of the following :**		**6M**
	(a)	**State the need of ENT in colour TV & explain its generation with neat circuit diagram.**		**6M**
	Ans:	 principle of split-diode addition to obtain EHT and focus anode potentials for a colour picture tube. EHT is a voltage generator, which generates around 17KV for B/W TV & 25 KV for colour TV		**Need : 2M** **Explanation : 2M** **Circuit Diagram :2M**

		using the principle of auto transformer action V=L di/dt In colour TV to generate EHT up to 25 KV the diode split addition technique is used. The principle of "DIODE-SPLIT ADDITION" is shown in figure. The three layers of secondary windings are shown wound round on the ferroxide core of the L.O.T. Each winding is identical to the other and has the same number of turns. The same magnitude of voltage will therefore be induced in each section every time the flyback derived input pulse get applied to the primary winding. Because of the close proximity of individual layers and interlayer capacitance exists between each of them. It is indicated in the diagram by dotted because this capacitor physically does not exist.If a diode is connected between the end of one layer of winding and the start of the next the AC voltages induced in each layer can be made to charge up all the inter-layer capacitances to the same voltage. Since capacitances are effectively in series, the total output voltage appearing at the output terminal is the sum of all the voltages appearing across all of them. The diode shown connected in series between the layers are physically embedded in the windings and form an integral part of the transformer. The three windings are so designed that voltage induced in each layer form the fly back transformer is 8.33KV. This makes the total potential equal to (8.33KV+8.33KV+8.33KV≈25 KV) and forms the EHT supply source.	
	(b)	**Draw labeled composite video signal for one line.**	**6M**

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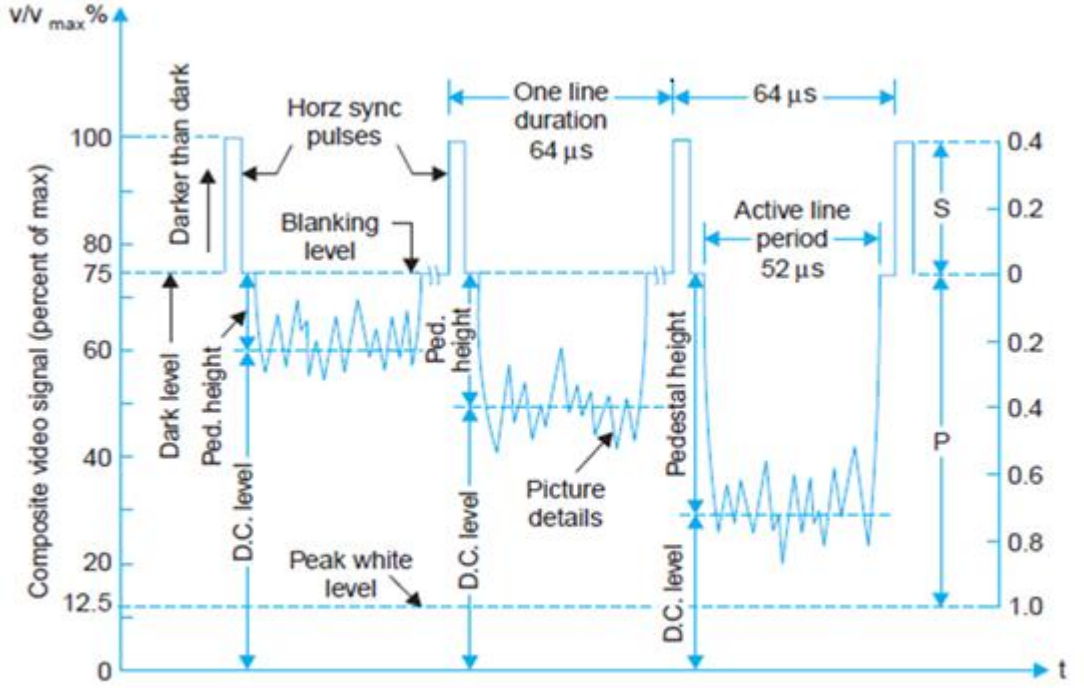
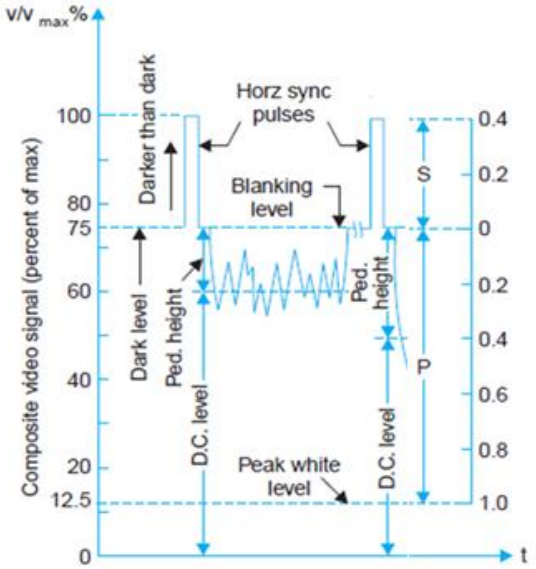
	Ans:	 OR 	**6M**

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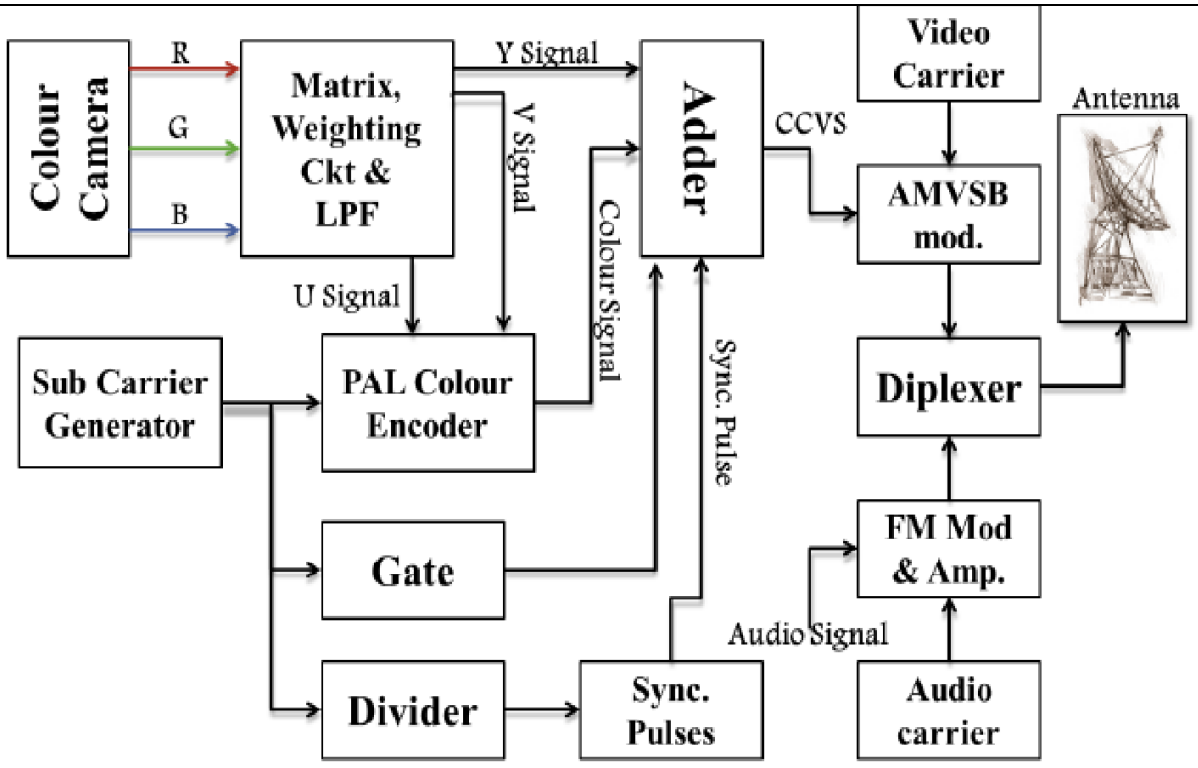
Q. No.	Sub Q. N.	Answers	Marking Scheme
5.		**Attempt any TWO of the following :**	**16- Total Marks**
Q. No.	Sub Q. N.	Answers	Marking Scheme
	a)	**Draw block dia of colour TV transmitter.**	**8M**
	Ans:	 **Fig:-Block Diagram Of Colour TV Transmitter** **OR**	**8M Diagram**

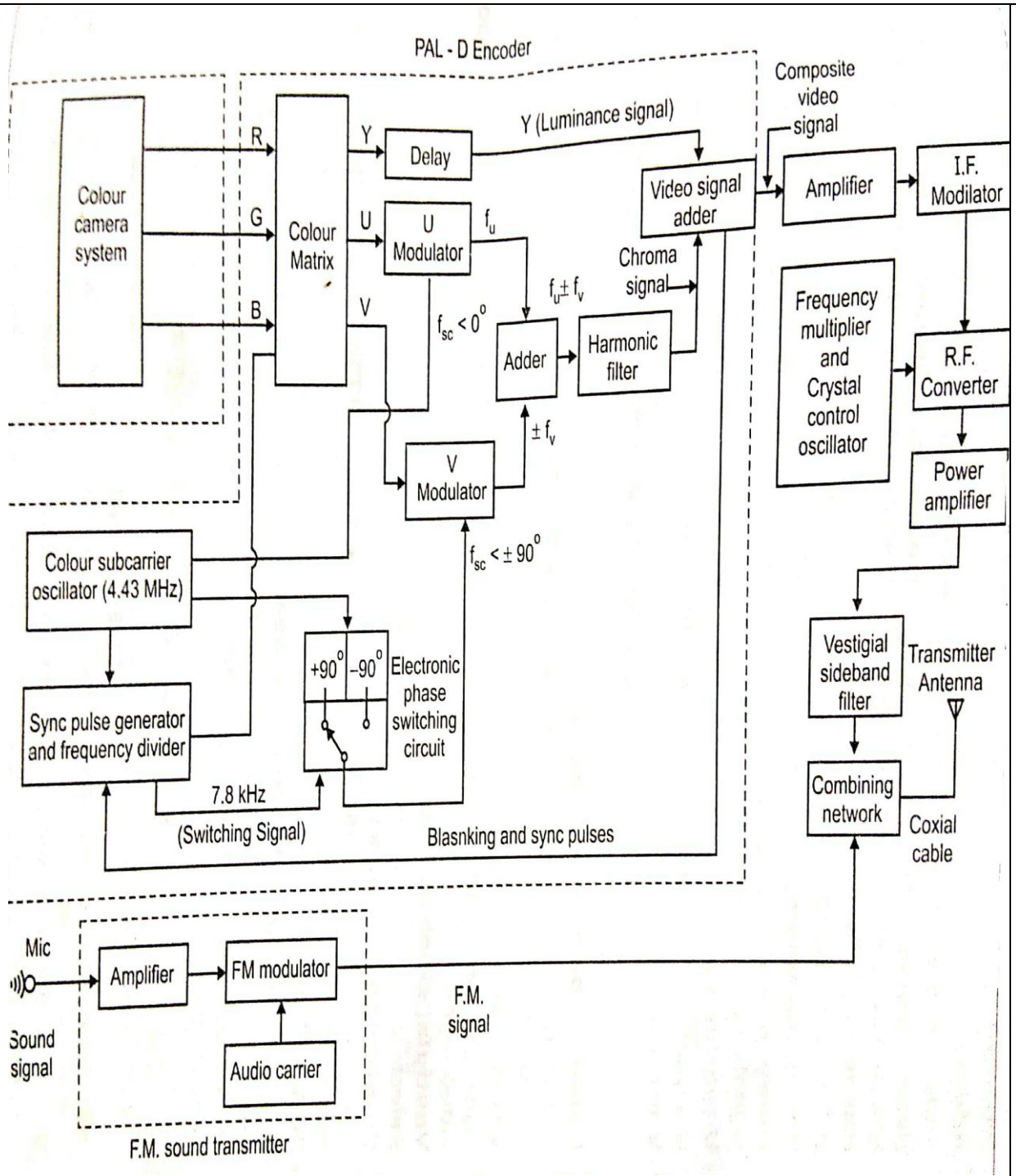
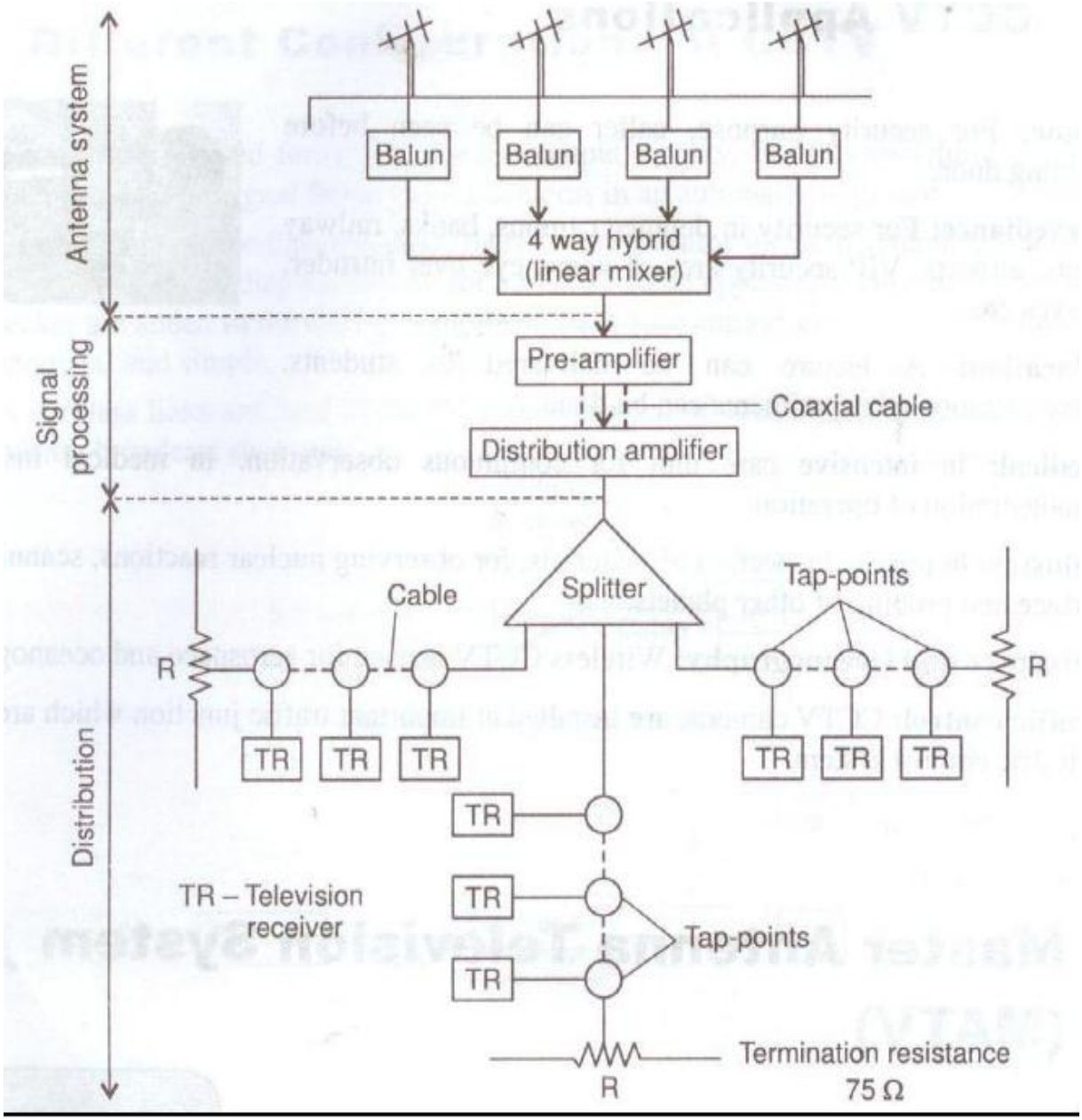
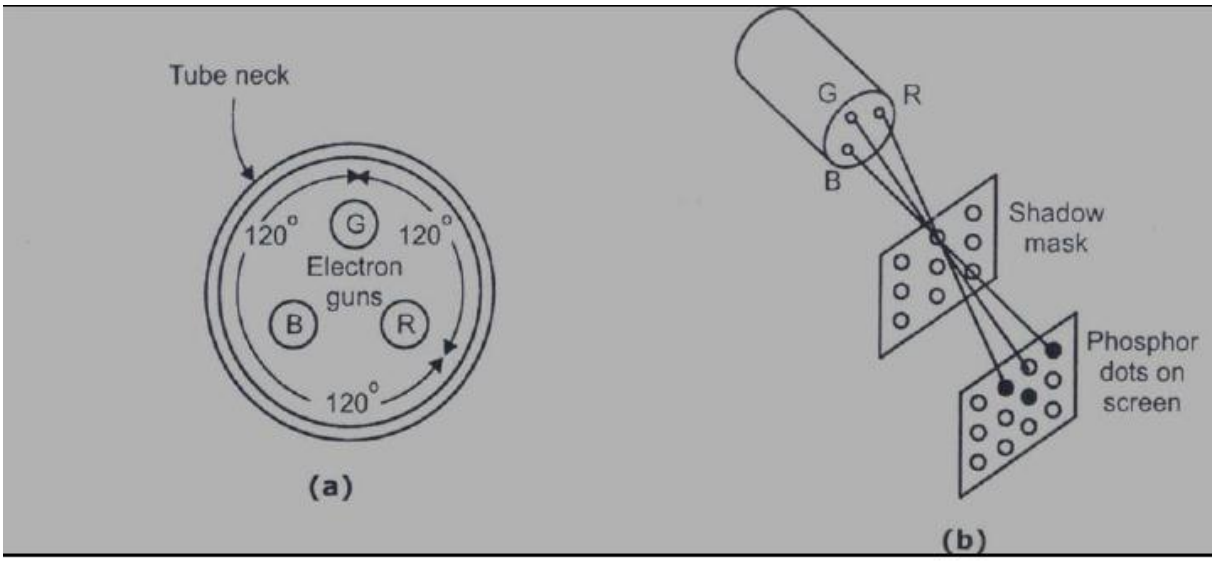


Fig:Block Diagram of colour TV transmitter

	b)	Draw layout dia of MATV. Explain it in detail.	8M
	Ans:	 **Fig:-Layout Of MATV**	4M Diagram 4M Explanation

		Explanation:-- The block diagram of a basic MATV system is shown in Fig. Master antenna TV system is used to deliver a strong signal (over 1mv). It is delivered from one or more antennas to every television receiver connected to the system. This type of system is implemented in the areas where signal strength is less. It is generally used in large hotels, schools and apartment building. **Master or common antenna:** One or more antennas are usually located on one roof top. The number of antennas is dependent on available telecast and their direction. Each antenna is directive and properly oriented. **Balun:** MATV system is having impedance of 75 Ω. Most of the antennas are having impedance of 300 Ω. Balun is used to match balance antenna with an unbalanced coaxial cable. It is a matching transformer. **Hybrid:** Antenna outputs feed in to a 4 way hybrid. A hybrid is a signal combining signal linear mixer. It provides suitable impedance matches to prevent standing waves produced. The standing waves results in ghost images. **Amplifiers:** There are two types of amplifiers. One is preamplifier which is low noise amplifier to keep SNR high at the antenna. The other is a high gain amplifier called as distribution amplifier. It is used to boost the signal to compensate the loss which would occur in the distribution cables. It provides acceptable signal to every receiver in the system. **Coupler or splitter:** Coupler or splitter is a coupling device which splits the signal to feed to the main branch lines. The output from distribution amplifier is fed to splitters trough coaxial trunk lines. A splitter is a resistive- inductive device. It provides trunk line isolation and impedance matching. **Subscriber taps:** Each branch line serves several homes. Coaxial distribution branch lines carry television signal. The output of splitter is delivered to subscriber through tap-offs. The subscriber taps can be transformer coupled capacitive coupled or resistive pads. The tap provides isolation from other receiver on the same trance. This prevents mutual interference. The taps look like ac outlets. They are mounted normally in the wall. Wall taps may be obtained with 300 Ω output or 75 Ω tap with a matching transformer is preferred. The matching transformer is mounted at the antenna terminal of the receiver. It will have a VHF output and UHF output. **TV receivers:** The modulated ratio frequency carrier is fed to each individual TV receiver. It is fed from respective tapping on the branch line. The feeder is off twin feeder type or coaxial cable. Its impedance is matched with impedance of TV receiver. **Terminal resistance:** The improperly terminated lines develops standing waves, each branch line should be properly terminated. For this, the end of each 75 Ω distribution cable is terminated with 75 Ω resistor is called terminator.	
	c)	**List different picture tubes used in colour TV. Explain any one in detail.**	**8M**

	Ans:	Different picture Tubes used in colour TV are: (i)Delta gun colour picture Tube (ii)Precision-in-Line(PIL) colour picture Tube (iii) Trinitron colour picture Tube  **Fig: Construction of Delta gun colour picture Tube** **Explanation:-** (i)Electron beams from the guns strike three phosphor dots of triad. The dots of red, green and blue phosphor in triad glow simultaneously, the intensity of phosphor dots being proportional to the intensity of video signal of respective colour. The eye adds the three colour emitted by the phosphor dots at time and perceives the resultant colour of the concerned pixel as the original picture. (ii) The triads glow one after other in quick succession due to deflection of the beams and hence whole picture is reproduced in its original colour. (iii) It employs three separate guns shown in fig , one for each phosphor (iv) The guns are equally spaced at 120^0 interval with respect to each other and tilted inwards in relation to the axis of tube .Thus, they form an equilateral triangular configuration forming the capital greek letter delta (Δ) so the name. As shown in the fig, the tube employs a screen where three color phosphor dots are arranged in groups known as triads. (v) Each phosphor dot corresponds to one of the three primary colours.	**2M Types** **2M Diagram** **4M Explanation(Any one type should be considered)**

		(vi) The triads are repeated and depends on the size of picture tube, are deposited on the glass face plate (3,33,000 triads) (vii)A thin perforated metal sheet known as shadow mark is located 1 cm behind the tube screen. (viii) The mask has one hole for every phosphor dot triad on the screen. (ix) The various hole are so oriented that electrons of three beams on passing through any one hole will hit only the corresponding color phosphor dots on the screen. (x) The ratio of the electrons passing through the holes to those reaching shadow mark is only 20% (xi) The remaining 80% of the total beam current , energy is dissipated as heat loss in shadow mask.	

Q. No.	Sub Q. N.	Answers	Marking Scheme
6.		**Attempt any FOUR of the following :**	**16- Total Marks**
Q. No.	Sub Q. N.	Answers	Marking Scheme
	a)	**State need of VSB in TV transmission. Draw its frequency response.**	**4M**
	Ans:	**Need of VSB in TV transmission**:- (i)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. (ii)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. (iii) This pattern of transmission of the modulated signal is known as Vestigial Sideband transmission(VSB). (iv) In 625 line system, frequencies up to 0.75MHz in the lower sideband are dully	**3M need** **1M frequency response**

radiated.

(v) 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 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

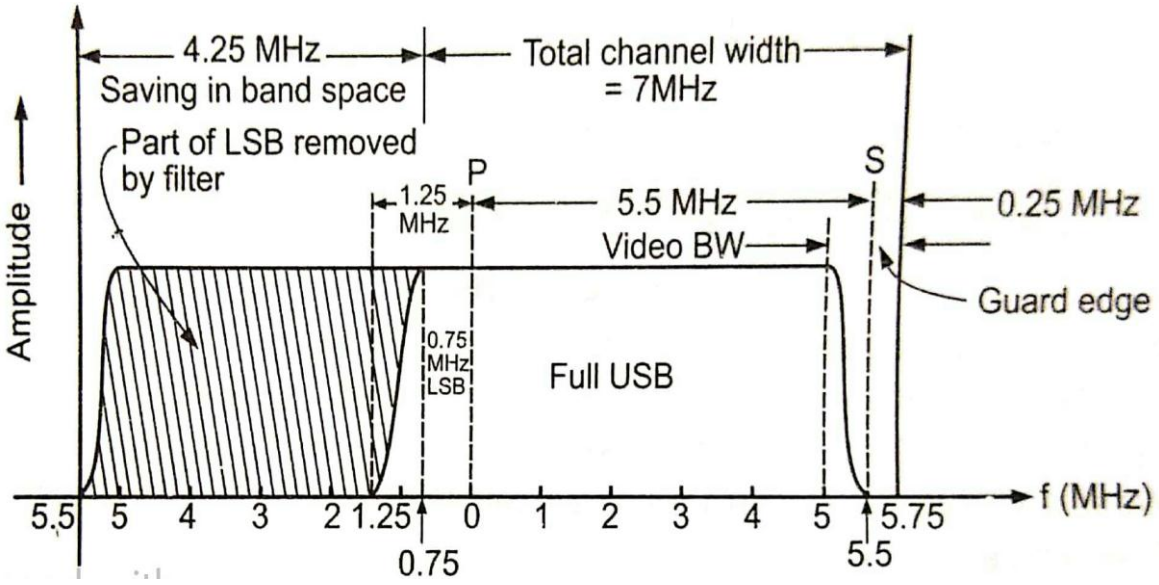


Fig:- Total channel bandwidth using vestigial Lower Sideband

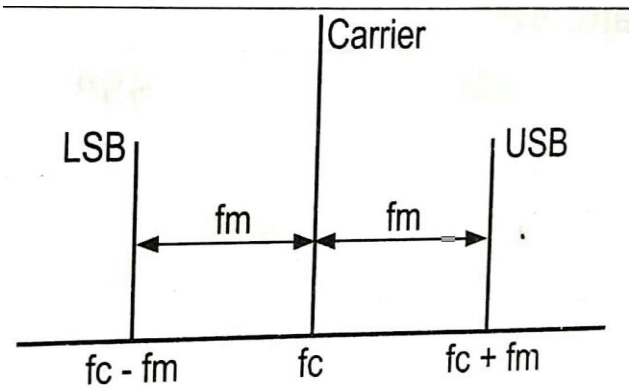
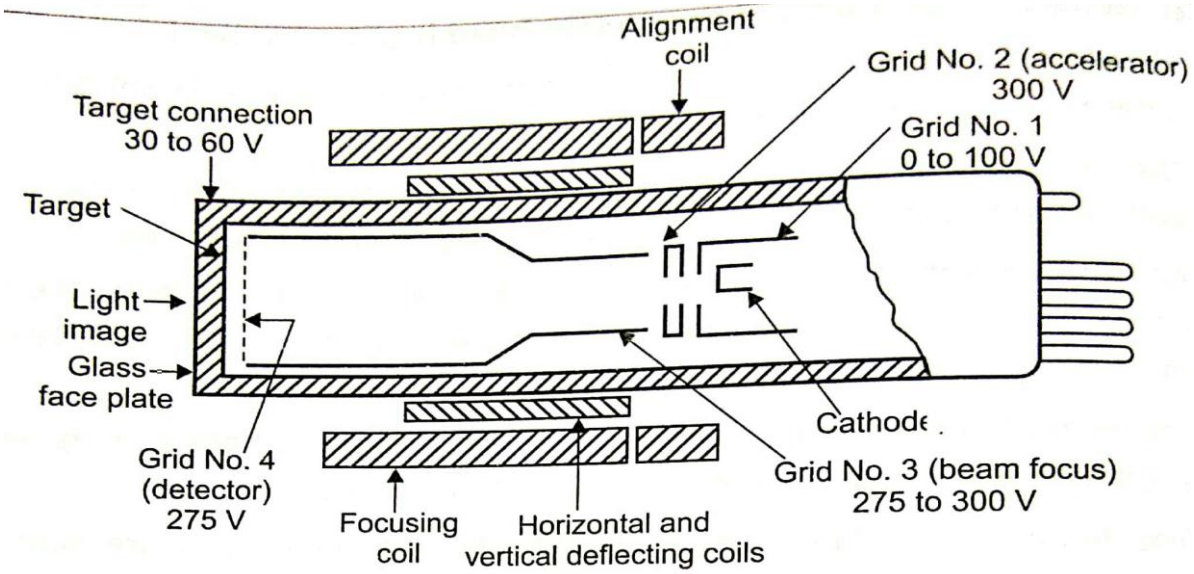


Fig:-Frequency Response

b) Draw construction of Vidicon Camera tube. State its working principle. 4M

	Ans:	 **Fig:- Vidicon Camera Tube** **Working :--** (i) As shown fig., the target consists of a thin photoconductive layer of either selenium or antimony compounds. This is deposited on a transparent conducting film, coated on the inner surface of the face plate (ii) This conductive coating is known as signal electrode or plate. Image side of the photo layer, which is in contact with the signal electrode, is connected to DC supply through the load resistance. (iii) The beam that emerges from the electron gun is focused on surface of the photoconductive layer by combined action of uniform magnetic field of an external coil and electrostatic field of grid No 3. Grid No. 4 provides a uniform decelerating field between itself, and the photoconductive layer, so that the electron beam approaches the layer with a low velocity to prevent any secondary emission. (iv) Deflection of the beam, for scanning the target, is obtained by vertical and horizontal deflecting coils, placed around the tube.	**2M Diagram** **2M Working**
	c)	**Draw block dia of LNBC and describe its working.**	**4M**

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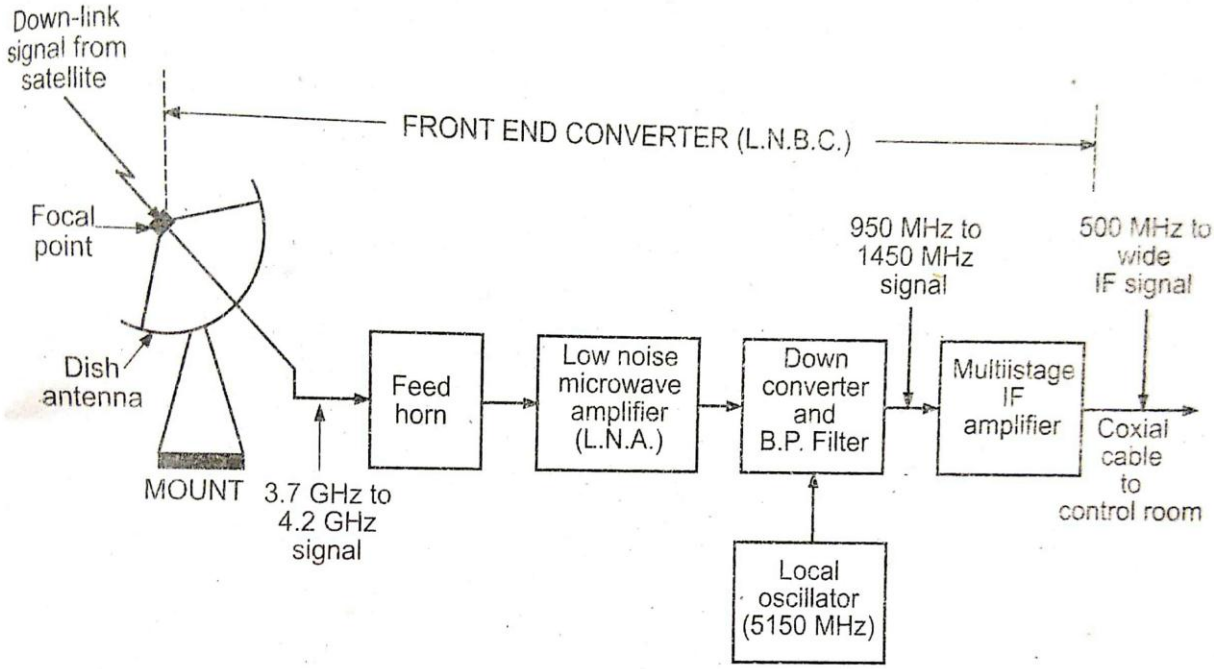
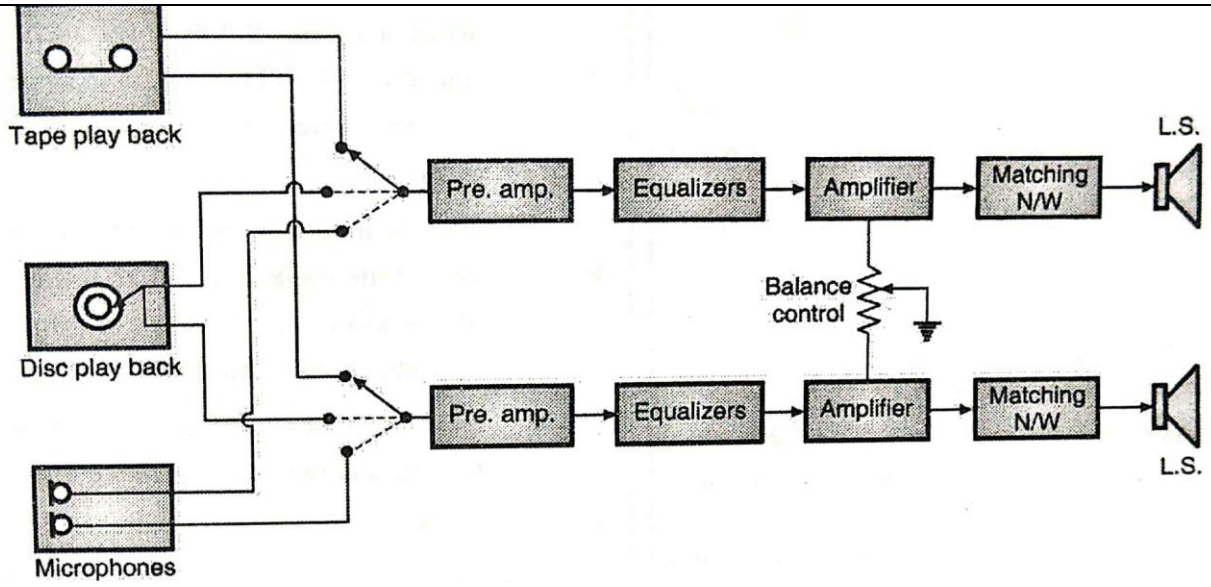
	Ans:	 **Fig Block Diagram of LNBC** **Working:-** (i)**Dish antenna and feed horn**: A feed horn is actually a flared open waveguide section which is mounted at focal point and its function is to receive signals reflected towards it by the delivers these to the close by located unit called as Low Noise Block Convertor (LNBC). (ii)**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. (iii)**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. (iv)**Band pass filter**: A BPF at the output mixer separates the wanted IF signals from the other signals. (v)**Multistage IF amplifier**: It amplifies the down converted signals and then sent through high grade coaxial cable to the CATV.	**2M Diagram** **2M Working**
	d)	**Draw block dia of Hi-Fi amplifier. Write function of each block.**	**4M**

	Ans:	 **Fig:-Block Diagram of Hi-Fi Amplifier** Figure shows the block diagram of a high-fidelity stereo reproducing system. It consists of following blocks: **(i) Source**: It is the the recorded stereo tape or disc.In live system it is microphones. (Stereo signal can also be obtained from the record player.) The stereo signal is fed to two independent amplification channels through a tape-mic switch. **(ii)Independent amplification channels:** Each channel consists of- **Pre-amplifier** -It consist of a low noise high gain amplifier, giving flat frequency response **Equalizer –** It improves SNR(signal to noise ratio)of recording system to give Hi-Fidelity to the reproduced sound .Total audio frequency range divides into number of frequency bands. **(iii)Amplifiers:** It has flat frequency response and provides little distortion by using negative feedback **(iv)Matching transformer:** It provides impedance matching between amplifier output and loudspeaker **(v)Balancing circuit:** It is used to balance out any imbalance in the characteristic of identical circuits in both channels. **(vi)Loudspeaker:** The secondary of the matching transformer of each channel is connected to the respective loudspeaker column. For Hi-fi, the loudspeaker columns consisting of woofer, squawker and tweeter are used. It converts electrical signal to original sound.	**2M Diagram** **2M Explanation**

	e)	**Explain the details of Horizontal sync, Pulse used in TV system.**	**4M**
	Ans:	Explanation:- Out of a total line period of 64 µs, the line blanking period is 12 µs. During this interval a line synchronizing pulse is inserted. The pulses corresponding to the differentiated leading edges of the sync pulses are actually used to synchronize the horizontal scanning oscillator. This is the reason , all time intervals are shown between sync pulse leading edges. The line blanking period is divided into three sections. These are the i) front porch ii) the line sync' pulse and iii) the back porch'. The time intervals allowed to each part are summarized below and their location and effect on the raster is illustrated as shown in fig below	**2M Diagram** **2M Explanation**

Details of Horizontal Scanning

Period	*Time (µs)*
Total line (*H*)	64
Horz blanking	12 ± .3
Horz sync pulse	4.7 ± 0.2
Front porch	1.5 ± .3
Back porch	5.8 ± .3
Visible line time	52

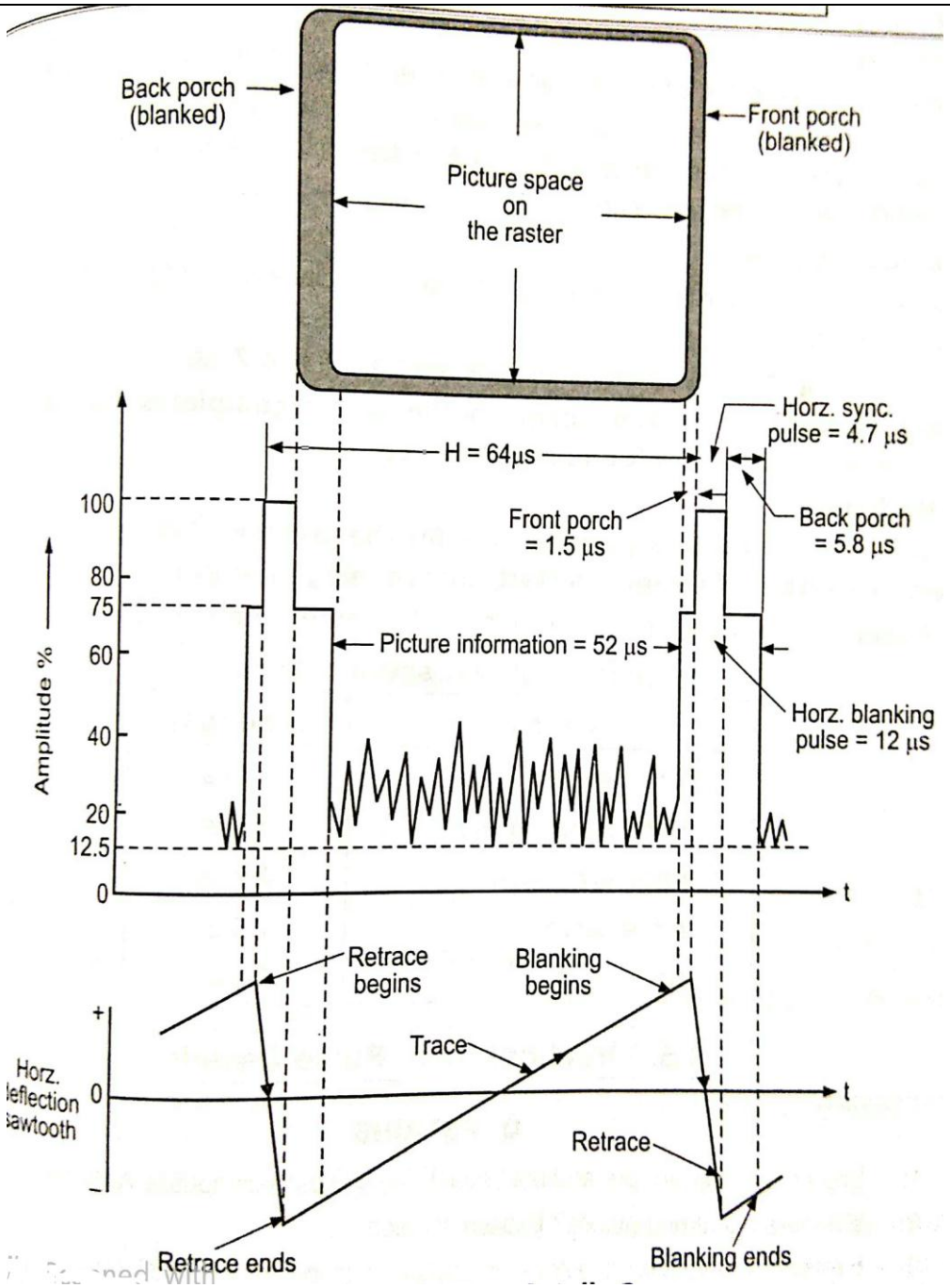


Fig: Horizontal sync details

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