



WINTER- 18 EXAMINATION

Subject Name: Audio Video Engineering

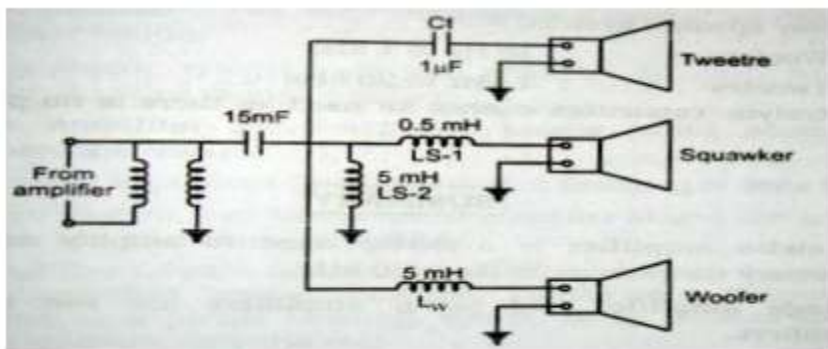
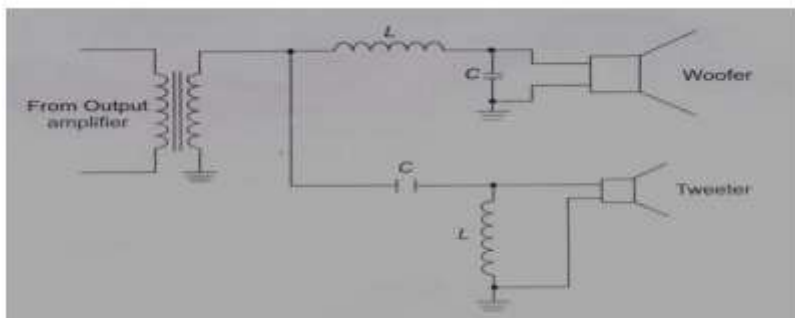
Model Answer

Subject Code:

17537

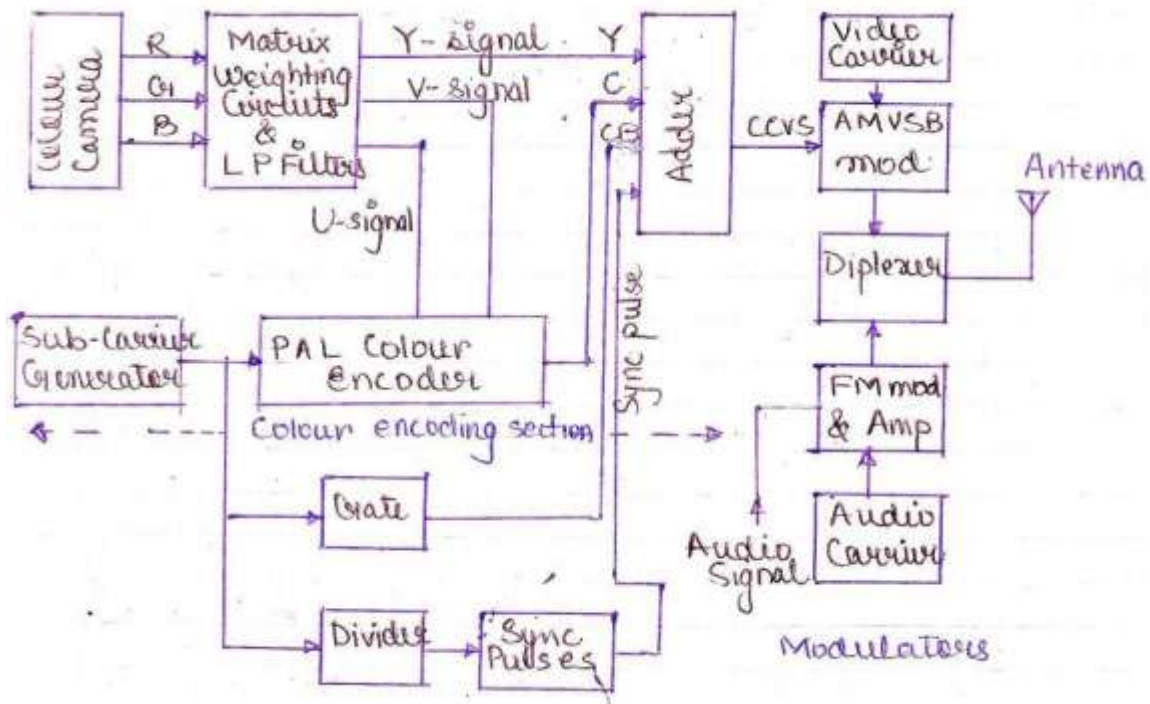
Important Instructions to examiners:

- 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.

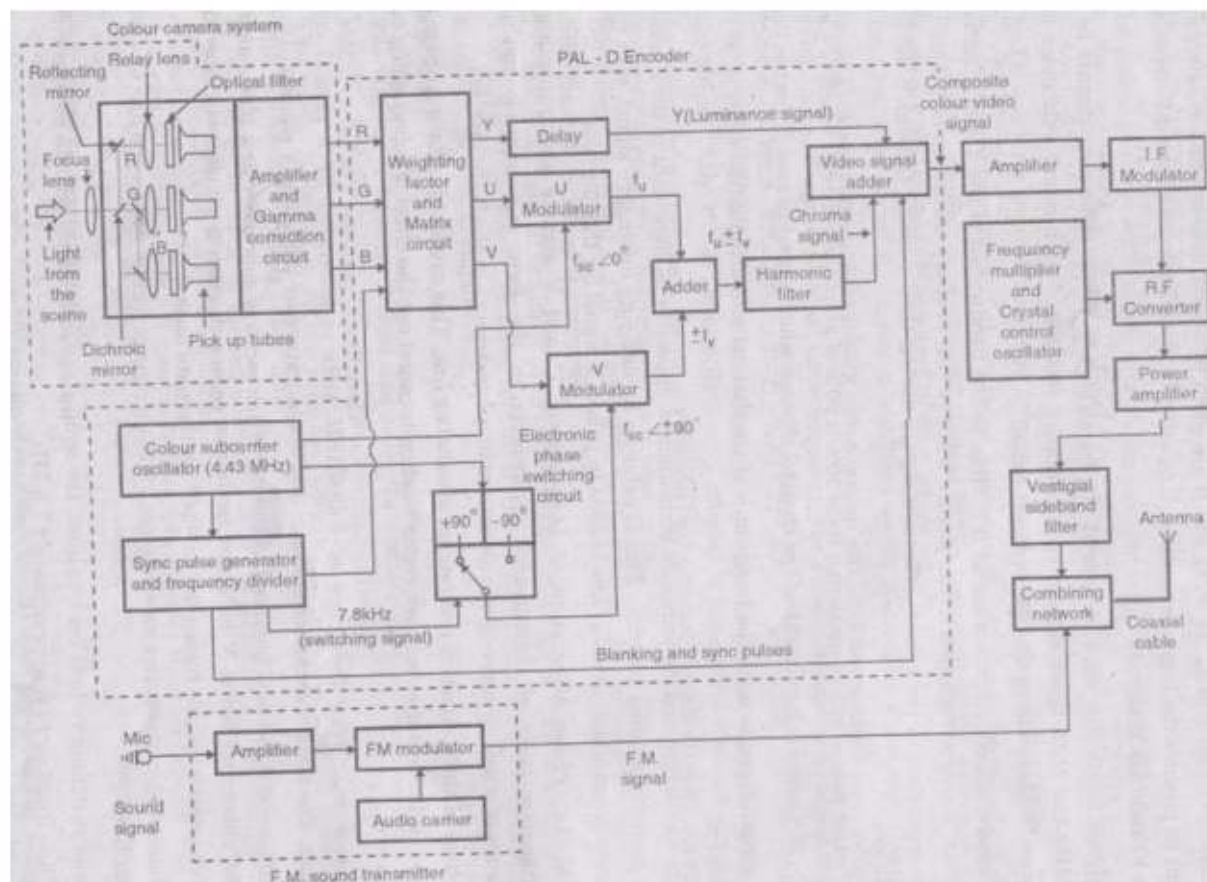
Q1 A	Attempe any three:	12
a)	Draw the cross over network circuit and state its function .	
Ans:	Diagram- 2 mks, explanation/ finction- 2 mks	
	<div data-bbox="388 617 1211 963" data-label="Diagram">  </div> <p style="text-align: center;">OR</p> <div data-bbox="406 1096 1196 1411" data-label="Diagram">  </div> <p>Functions</p> <ul style="list-style-type: none"> • The circuit consists of a low-pass LC filter across the woofer and a high-pass LC filter across the tweeter. • The low pass LC filter permits only low audio frequencies (16Hz to 1KHz) to go to woofer. • The series reactance of L and shunt capacitance of C for high audio frequencies prevents these frequencies going to the woofer. • The high-pass filter consisting of C in series and L in shunt allows the high audio frequencies to pass to the tweeter and blocks the low frequencies. 	
b)	List specifications of cable TV	
Ans:	Any 4 specifications- 4 mks	
	<ol style="list-style-type: none"> 1. C- band= 3.7 to 4.2 GHz downlink freq.) 2. Look angle = 360⁰ rotation in azimuth, 18 to 19⁰ in elevation 	



	<ol style="list-style-type: none">3. Offset angle = 24.62 limit4. Elevation angle range = 17 to 19° limit5. Input freq. = 3.625 to 4.2 GHz6. Output freq. = 950 to 1525 MHz7. I/O Impedance = 758. Isolation = <35°9. Frequency response = 45 to 550MHz10. Noise Figure = 7dB11. Gain = 40dB12. Type of cable = Coaxial RG 1113. Connector= F type
c)	Define: i. Aspect ratio ii. Image continuity w.r.t. T. V. system
Ans:	<p>Each definition- 2 mks</p> <p>Aspect Ratio:</p> <p>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.</p> <p>Aspect Ratio= Width of the Screen/Height Of the Screen=4/3</p> <p>Image Continuity:</p> <p>While televising picture elements of the frame by means of the scanning process, it is necessary to present the picture to the eye in such a way that an illusion of continuity is created and any motion in the scene appears on the picture tube screen as a smooth and continuous change</p>
d)	State the advantages of vacuum fluorescent
Ans:	<p>Any 4 Advantages: 4 mks</p> <ul style="list-style-type: none">• Displays the pitch of the channel, band etc. Helps the listener to adjust the pitch of his interest by seeing the display.• Helps to know the voice band when using the karaoke system.• Uniform brightness, low cost etc.• 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.
B)	Attempt any one: 6
a)	Draw block diagram of Colour TV transmitter and mention the function of each block
Ans:	<p>Block diagram- 3 mks, Function of each block – 3 mks</p>



OR



Functions-

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

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

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

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

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

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

2. PAL encoder:

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

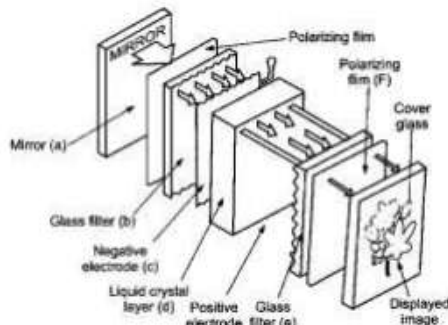
The PAL encoder consists of a sub carrier generator and two balanced modulator with filters to produce modulated sub carrier signal. These signals are added vertically to give Chroma signal (C).

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



	<p>3. Video and Audio modulators and transmitting antenna:</p> <p>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.</p> <p>Audio signal modulates separate carrier. This modulation is FM type.</p> <p>AMVSB video signal along with audio signal passes to the transmitting antenna through Diplexer Bridge which is a whetstones bridge.</p>
b)	State and explain the working principle of LED TV systems. List its advantages.
Ans:	<p>Diagram – 2 mks, working – 2 mks, Any 4 advantages- 2 mks</p> <p>Working:</p> <p>An LED screen is actually an LCD screen, but instead of having a normal CCFL backlight, it uses light-emitting diodes (LEDs) as a source of light behind the screen. An LED is more energy efficient and a lot smaller than a CCFL, enabling a thinner television screen. Marketing made a lot of fuss about LED TVs, but it is only the backlight that changed, so there is actually no picture quality improvement over a normal LCD screen.</p> <p>There are three main configurations of LED as backlights for television screens:</p> <ul style="list-style-type: none">• full array,• edge lit,• direct lit. <p>Full array:</p> <p>This method is considered the best LED backlight type, but can only be found on a limited number of models. In a full array LED screen, the LEDs are distributed evenly behind the entire screen. This produces a more uniform backlight and provides a more effective use of local dimming, where it can change the luminosity of only a specific part of the screen.</p> <p>Edge lit:</p> <p>This is the most common method for LED TVs. With an edge lit LED screen, the LEDs are placed at the peripheral of the screen. Depending on the television, it can be all around the screen or only on the sides or the bottom. This allows the screen to be very thin.</p> <p>Direct lit</p> <p>This is how the lower-end LED TVs are constructed. Similarly to the full array method, the LEDs are directly behind the screen. However, there are very few of them and they cannot be controlled separately to match the luminosity of the picture</p>

Diagram:-



Advantages of LED TV.

- The LED TV is more advanced version of LCD TV.
- The LED TV use LCD panel with LED backlighting.
- An LED TV illuminates its LCD panel with light-emitting diodes.
- LEDs consist of small semiconductors, which glow during exposure of electric current.
- Specifically, this current flows between anodes, which are positively charged electrodes, and LED cathodes, which are negatively charged electrodes.
- In contrast, a traditional LCD utilizes fluorescent lamps for backlighting.
- LEDs have several advantages over fluorescent lamps, including requiring less energy and being able to produce brither on-screen colours.
- There are two types of LED lighting technology that LED TVs can utilize:
 - (a) Full-array LED backlighting.
 - (b) Edge-lit LED backlighting.
- Full-array technology employs arrays or banks of LEDs that cover the entire back surfaces of LED TV screens.
- In contrast, edge-lit technology employs LEDs only around the edges of LED TV screens.
- Full-array technology allows superior contrast ratio and superior overall picture quality.

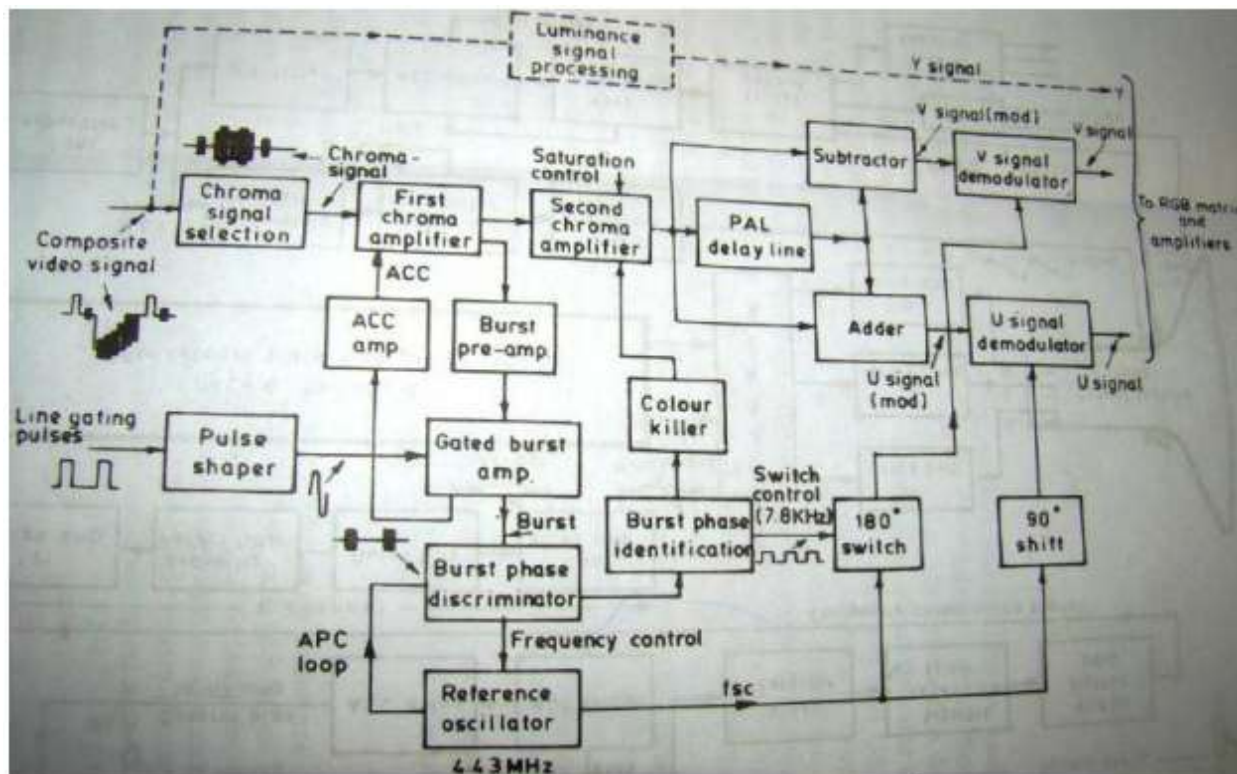
Q2	Attempt any four:	16
a)	Describe the development of HDTV and its associated system	
Ans:	Proper relevant description- 4 mks	



	<ul style="list-style-type: none">• The world wide pioneer in HDTV for many years now has been NHK, the Japan Broadcasting Corporation Tokyo.• The standards adopted include 1125 scanning lines per frame, 60 fields per second, 2 : 1 Interlace Scan and an aspect ratio of 16 : 9.• The 1125 lines were chosen to get an approximate doubling of vertical resolution and to allow for a 9/5 and 15/7 down conversion to Europe's 625 line PAL standard and America's 525 line NTSC standard respectively.• However Europe showed reluctance to accept these Japan standards and started its own project of HDTV in June 1986 named 'EUREKA', a co-operative venture of 32 countries of that region.• The Eureka system is designed to be compatible with C.C.I.R standards but with line numbers equal to 1249 and an aspect ratio of 16 : 9.• Though the NHK Japan standards are quite suitable for USA but many other considerations are their.• To process such transmissions, the present receivers would need a complex and expensive converter.• In addition, the signal occupies too much RF bandwidth approximately 10 MHz compared to 6 MHz in the NTSC system for a single channel.• One such as the CBS system for compatible transmission of HDTV signals designed principally for satellite broadcasting.
b)	<p>Define the following terms:</p> <p>i Hue ii Luminance</p> <p>iii Viewing distance iv Saturation</p>
Ans:	<p>Each definition – 1 mks</p> <p>i. 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</p> <p>ii. Luminance: Luminance is the amount of light intensity or the total amount of light energy that is received by the eye irrespective of the colour of light. In monochrome TV, better lighted parts have more luminance than dark areas and different colours have shades of luminance.</p> <p>iii. Viewing distance: The distance between the viewer and the TV screen is known as viewing distance. The viewing distance from screen of TV receiver should not be too large or too small. The distance varies from person to person and lie between 3 to 8 times the picture height. While viewing TV small light should be kept 'On' to reduce contrast.</p> <p>iv. Saturation It represents the spectral purity of a colour light. It is the amount of white light that is mixed with a colour.</p> <p>A fully saturated colour will have no white light mixed with it. For example, a Pure Red without White is a saturated colour.</p>

c) Draw the block diagram and explain operation of PAL-D decoder

Ans: Block diagram-2 mks, operation- 2 mks



Explanation:

Chroma signal selection:

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

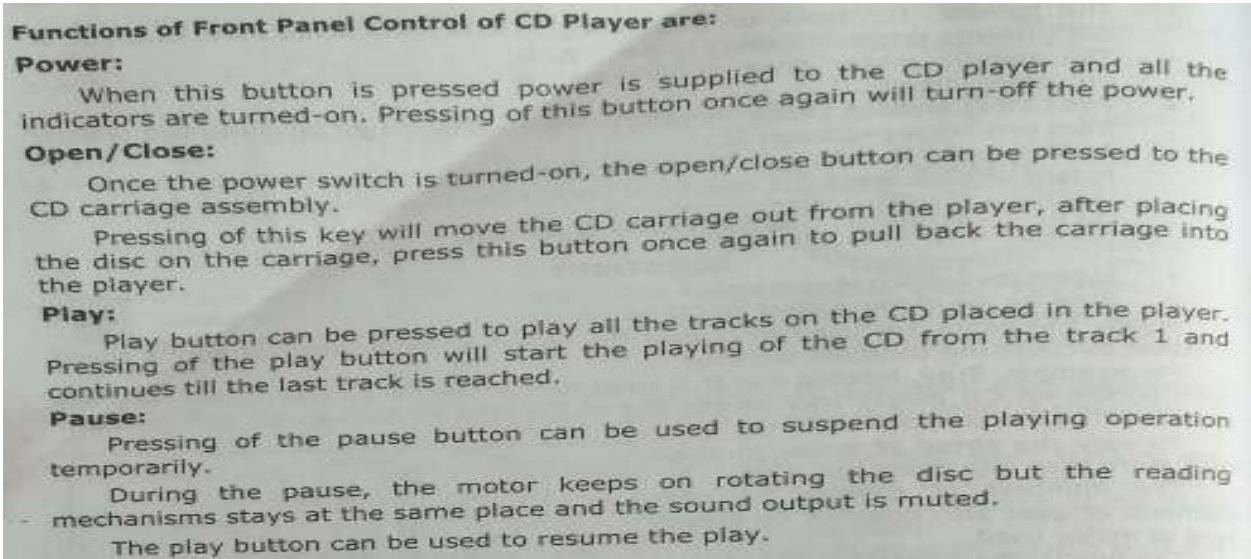
The second chroma amplifier incorporates colour saturation control circuit. The output of colour killer also feeds into it.

PAL delay line (separation of U and V colour phasor):

This network separated U and V signals with are then fed to respective demodulator.

Gated burst amplifier:



	<p>The gated burst amplifier separates the burst pulses and amplifies them a level suitable to operate the burst phase discriminator.</p> <p>Automatic Chroma Control (ACC):</p> <p>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.</p> <p>Burst phase discriminator:</p> <p>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.</p> <p>Burst phase identifier:</p> <p>This circuit is able to identify the phase relationship of the colour burst.</p> <p>180° switch:</p> <p>This switch is used to periodically invert the waveform fed to the v-signal demodulator.</p> <p>Colour killer control:</p> <p>This is just a half wave rectifier which produces a steady dc potential from the succession of burst pulses. During black and white transmission the dc potential is absent and hence biases the 2nd chroma amplifier to cutoff state.</p>
d)	List and describe the functions of front panel controls of CD player mechanism.
Ans:	<p>Any 8 control panel functions – 4 mks</p> 

Stop/Clear:

When the stop/clear button is pressed the play stop, the disc stops spinning, and the pick-up will return to the starting of the disc, i.e. at the innermost track. This will also clear any program in the memory of the CD player.

Program:

The CD player can be programmed to play the tracks on the disc at a different order than the normal serial order, by selecting the required track and pressing the program button.

FF/FB or FF/FR:

The FF (Fast Forward) and FR (Fast Reverse) or FB (Fast Back) key can be used to quickly reverse or forward the playing of the current track.

Call:

This button when pressed will indicate the programmed numbers that are to be played next.

Repeat:

This button can be pressed to repeat the play of the CD being currently played. Pressing of this key will also turn the repeat LED on.

Track Number Indicator:

When a new CD is first loaded in the player, this track number indicator shows the total number of the tracks on the CD.

During normal play operation it shows the track number currently being played by the CD player.

During the programming it shows the track number selected for programming.

Time Counter:

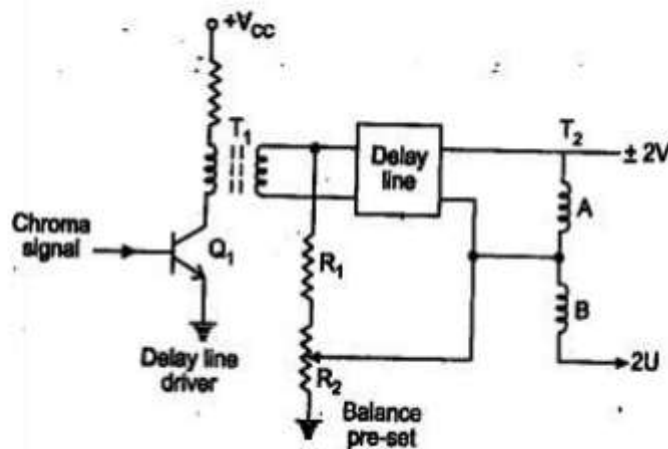
The time counter shows the total playing time of the disc, when a disc is first time loaded into the player.

e) Draw the basic circuit for the separation of U and V signals and describe its working

Ans:

Circuit – 2 mks, description- 2 mks

Diagram:-





Explanation:-

Chroma signal is applied to Q1. Chroma signal is applied to delay line through transformer T1. This signal after delay line appears across A winding. Direct signal is fed to center top of T2 transformer. Voltage induced into winding A and B is equal in magnitude but opposite in phase due to signal from delay line. Whereas voltage induced into winding A and winding B is equal in magnitude and same phase. This means that direct and delayed signals have same phase in one winding but are of opposite phase in second winding. Thus results in separation of U and V signal.

f) Differentiate between stereo amplifier and mono amplifier

Ans: 4 points of relevant comparison- 4 mks

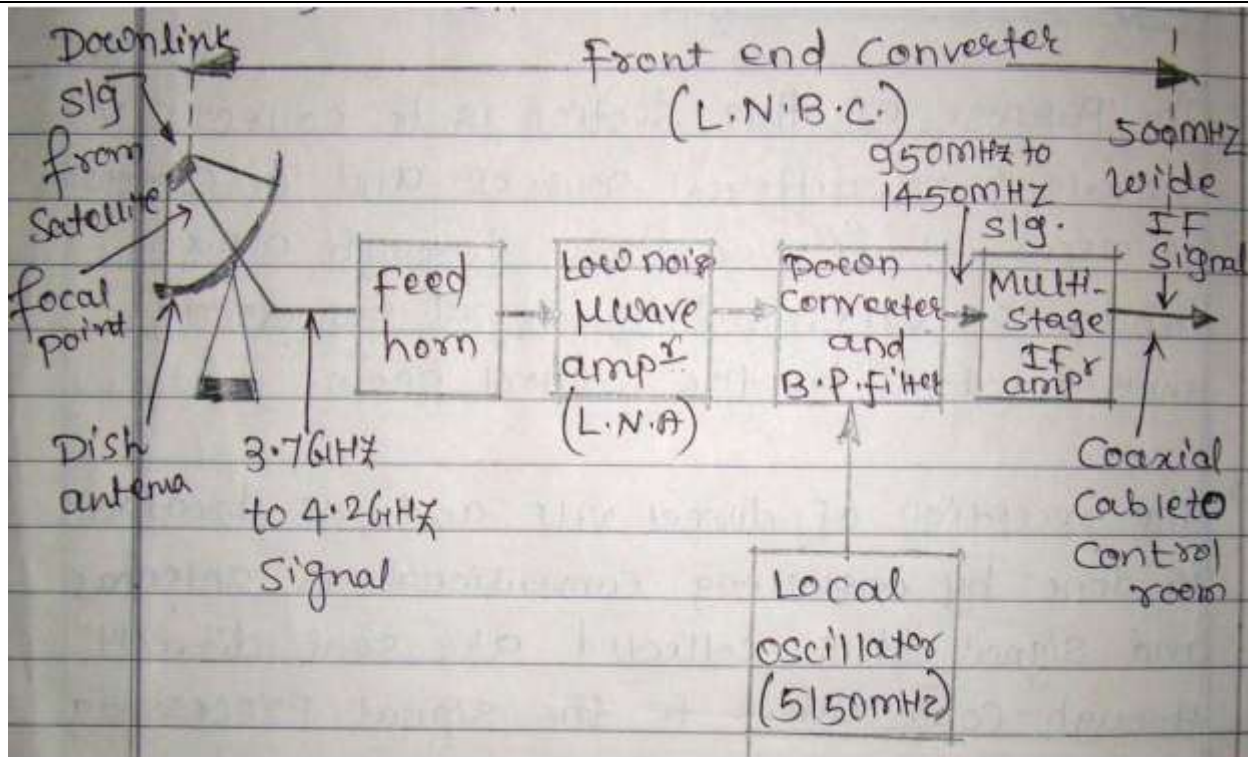
SR.No	Stereo amplifier	Mono amplifier
1	Stereo means solid and phone is sound in Greek, means three dimensional sound.	Mono means one sound or one dimensional sound.
2	Sound arises from the two different amplifiers so that sound appears to be surrounded.	Monophonic sound system has one source
3	It has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

Q3 Attempt any four:

16

a) State and explain the working principle of LNBC

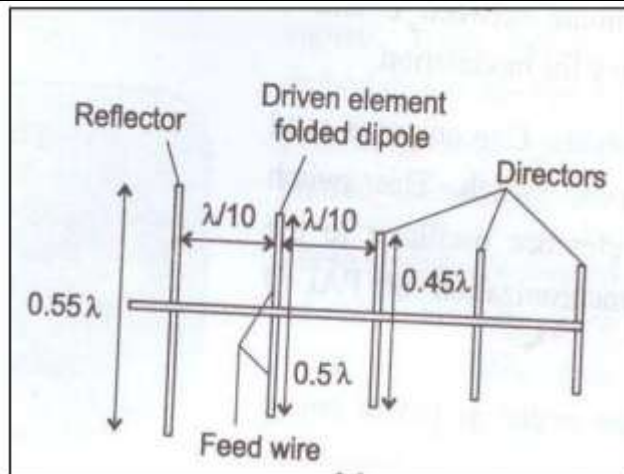
Ans: Diagram- 2 mks, state and explain – 2 mks



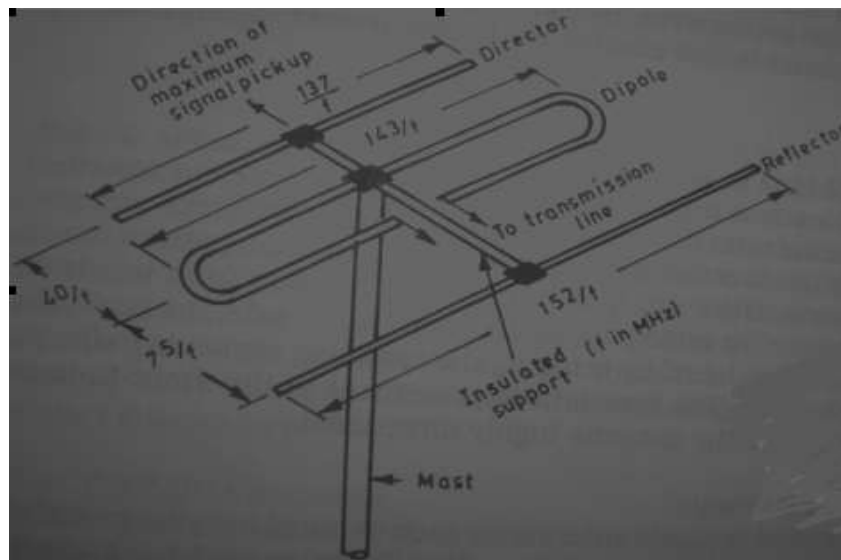
- **Dish antenna and feed horn:** A feed horn is actually a flared open waveguide section which is mounted at focal point and its function is to receive signals reflected towards it by the delivers these to the close by located unit called as Low Noise Block Converter (LNBC).
- **Low Noise Amplifier (LNA):** The CVS collected by the feed horn is fed to LNA which is specially designed to provide enough gain which maintains maximum possible S/N ratio.
- **Mixer (down convertors):** Mixer translates the incoming microwave signals to a lower frequency range of 950-1450MHz. This is achieved by mixing local oscillator frequency of 5150 MHz at mixer and selecting only the difference from output.
- **Band pass filter:** A BPF at the output mixer separates the wanted IF signals from the other signals.
- **Multistage IF amplifier:** It amplifies the down converted signals and then sent through high grade coaxial cable to the CATV.

b) Draw the construction and state the operating principle of Yagi-Uda antenna.

Ans: Construction- 2 mks, operation- 2 mks



OR



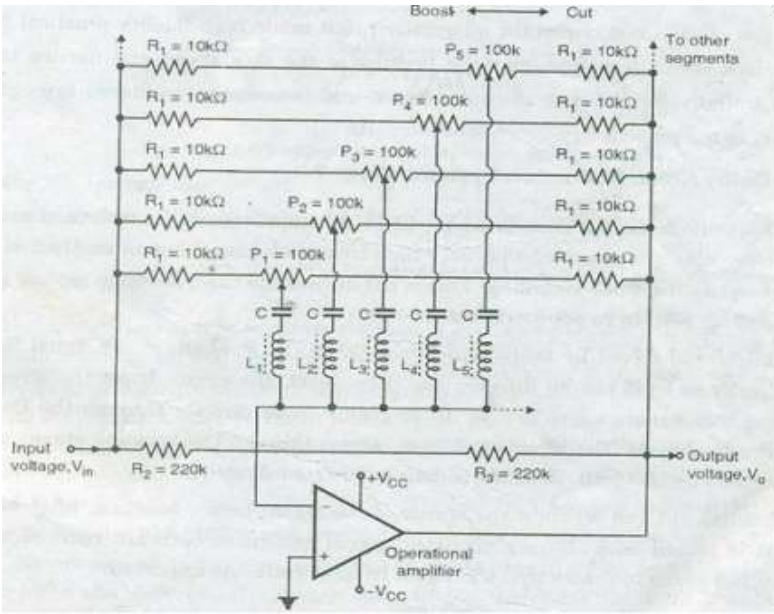
Explanation-

It consists of driven element i.e. dipole antenna, reflector and director. They are arranged collinearly and close together.

Such antennas are widely used for TV signal reception at receiver for locations within 40 to 60 KM from transmitter.

The reflector is placed the back of the folded dipole, reflector reflect unwanted signal. The director is placed in front of folded dipole which collect wanted signal.

The directors are always more than one and always face the transmitting antenna. The folded dipole with one or two directors and reflector gives high gain. It also provides high beam width per unit area of array, so some times they are called as 'Super gain antenna'. The reflector and directors are collectively called as parasitic elements.

	<p>The separation between the reflector, folded dipole and directors is minimum 0.1λ. If this distance is reduced than 0.1λ, then the input impedance of the array get decreased. The radiation pattern can be improved by increasing front to back ratio. This can be obtained by bringing radiators closer i.e. array element closer. The signal feed point is at folded dipole. The parasitic element are not connected anywhere electrically.</p>
c)	Draw the circuit diagram of graphic analyzer and describe its operation.
Ans:	<p>Circuit diagram- 2 mks, description- 2 mks</p>  <p>Explaination: Graphic equalizer is used to eliminate unwanted peaks in the frequency response of audio systems. In five point configuration, the graphic equalizer breaks up an audio input signal into five different bands covering the range of human hearing. Once this is completed, the signal in each band can be adjusted to provide best sound. The center frequencies f_1, f_2, f_3, f_4 and f_5 of the frequency bands of the graphic equalizer are usually fixed at pre-set values. Once these bands are added back together, they are passed through an amplifier which increases the amplitude of the signal to the point where there is enough power that can be heard through an ordinary speaker. The graphic equalizer consists of an amplifier for every segment of octave band. Such amplifiers are connected in parallel to cover the complete frequency range. The individual gains of these amplifiers are adjusted such that the required frequency response is obtained. Using five amplifiers for five octaves of frequency may be very expensive.</p>
d)	<p>Explain the functions of following:</p> <ol style="list-style-type: none"> CD pick up assembly CD gear system
Ans:	<p>Each function- 2 mks</p> <ol style="list-style-type: none"> CD pick up assembly The pick-up assemble consist of –



	<ul style="list-style-type: none"> • 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 photo-diode array • A photo diode array to obtain data, focus and tracking signal from the reflected laser beam. <p>Focus and tracking coils to focus the beam to the CD surface and to move the assembly to proper track across the disc surface</p> <p>ii) CD gear system</p> <ul style="list-style-type: none"> • The gears are used to control the speed of motor and keeps this speed constant to cover the constant distance. Eg. Tray, loading motor is used to load the CD on tray. When we press open button on CD player tray comes out of CD. The motor rotates with constant speed and covers constant distance • To vary the speed of motor in steps then more than one gears are used. • The number of grooves are on gear diameter of gear also depends on type of motor used.
e)	State and explain Grassman's law
Ans:	<p>Statement- 2 mks, explanation- 2 mks</p> <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p><i>Grassman's law</i></p> <p>As stated earlier, the eye is not able to distinguish each of the colours that mix to form a new colour but instead perceives only the resultant colour. However, for the TV system it is necessary to know the quantum of each colour that on combining with other colours creates the additive effect of a new colour. Based on the sensitivity of human eye to various colours, reference white for CTV has been chosen to be a mixture of colour light fluxes in the following ratio:</p> <p style="text-align: center;">100% white = 30% red + 59% green + 11% blue.</p> <p>Similarly, yellow can be produced by mixing 30% of red and 59% of green, magenta by mixing 30% of red and 11% of blue and cyan by adding 59% of green to 11% of blue. Based on this it is also possible to produce white light by mixing 89% of yellow and 11% of blue or 70% of cyan and 30% of red. Thus, the eye perceives new colours depending on the algebraic sum of red, green and blue light fluxes. This forms the basis of colour signal generation and is known as 'GRASSMAN's LAW'.</p> </div>
Q4 A	<p>Attempt any three: 12</p>
a)	<p>Describe the following w.r.t composite video signal:</p> <p style="text-align: center;">i) Pedestal height ii) Blanking pulse</p>
Ans:	Diagram- 2 mks, each definition-1 mks

Diagram-

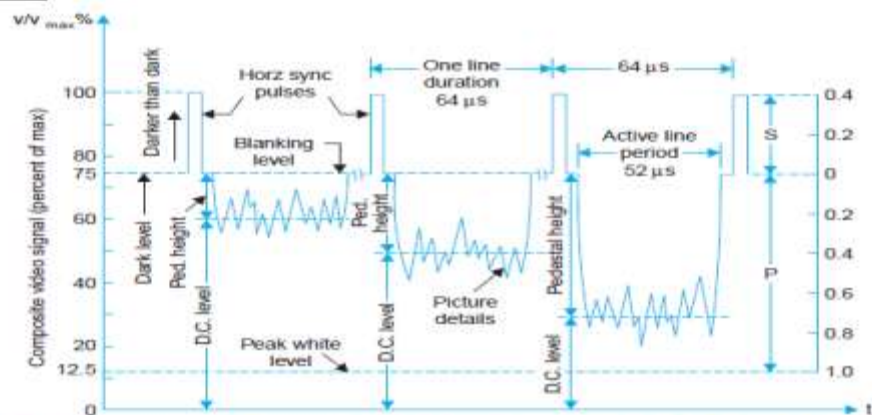


Fig. 3.1 Arbitrary picture signal details of three scanning lines with different average brightness levels. Note that picture to sync ratio $P/S = 10/4$.

Pedestal height:

Pedestal height is the distance between the pedestal level and average value (dc level) of the video signal. This indicates average brightness since it measures how much the average value differs from black level.

Blanking level:

The level above which the picture information is invisible on TV raster (Screen). The Blanking level starts at 72-75% of total amplitude of picture information.

b) State the merits and demerits of negative modulation

Ans: 2 merits and 2 demerits- 1 mks each

Merits of Negative Modulation:

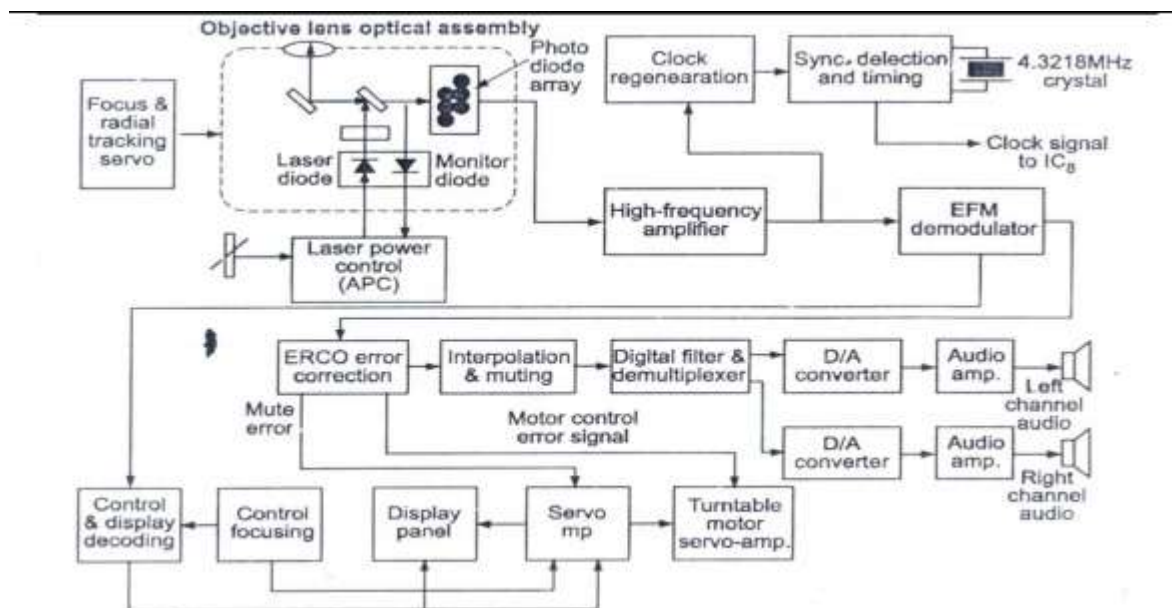
- Lesser noise interference on picture signal.
- Possible to obtain larger peak power output.
- Less picture signal distortion.
- Easy to develop true AGC voltage.
- More efficient operation.
- More power available from the transmitter
- Saving in transmission power

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 the block diagram of CD player and explain its operation

Ans: Block diagram- 2mks , explanation – 2 mks



CLV: The CD player is also known as CLV or constant linear velocity system. In a CLV

device such as the CD player the rotational speed of disc player is adjusted with movement of reading mechanism on the disc surface. This speed is changed to maintain constant linear velocity i.e. the signal on the disc surface always moves at constant speed of 1.3 m per second under the pick-up head.

Half-Full Memory: This half –full memory circuit makes the disc to maintain a constant linear velocity when the reading mechanism moves from outer tracks of disc to inner tracks or from inner tracks to outer tracks on disc surface.

Decoding CD: During the decoding, the digital data on the disc surface is read by the decoding circuit and is converted Into the analog and 0 signal required to drive the speakers and regenerate the stored music.

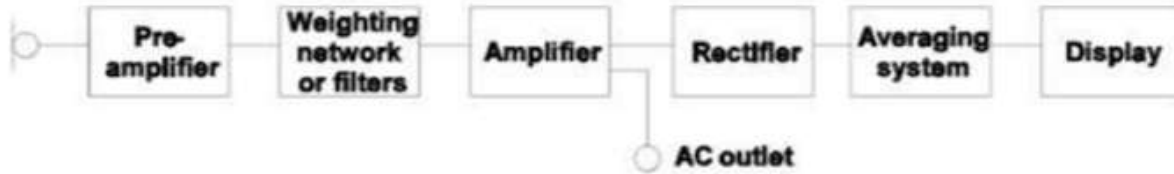
Optical pick-up: The signal stored on the CD surface as pits and flat areas are first picked up by the optical pickup made of lens assembly prism, photo detectors and laser diodes assembly in the optical pick-up unit.

High frequency amplifier: The signal is very weak so it is amplified by a high frequency RF amplifier circuit to bring signal to a proper level. This amplified and filtered highfrequency signal contains audio signal as well as synchronization signal in 14-bit EFM (eight to fourteen modulated) format, this signal is sent to an EFM demodulator circuit.

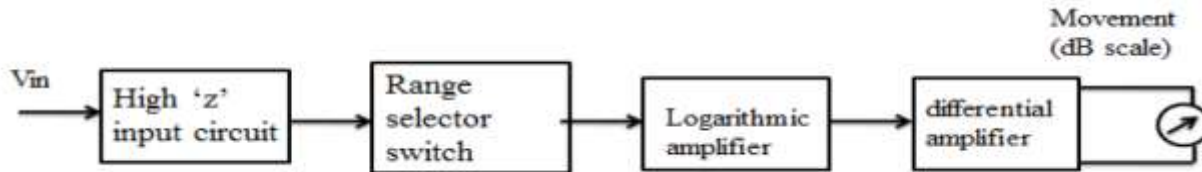
EFM Demodulator: The EFM modulator separates the modulated data and the timing signal from the signal



	<p>received at its input. It also removes the additional coupling bits and convert the 14-bit EFM symbol to actual 8-bit data. The amplified and filtered EFM signal from high frequency amplifier is also given to clock generation circuit to synchronize detecting and timing circuit. These circuits are used to recover the bit clock and sync pattern data .The timing separated by this system is used to provide timing signal to the system.</p> <p>ERCO Circuit: demodulated data from EFM demodulator is send to error correction (ERCO) circuit. The demodulated data signals also send to control and display decoding circuit, which recovers the control and display signal received from CD.</p> <p>Interpolation and muting: The ERCO circuit is used for error detection and correction purpose. Any error found in the incoming data signal is send to interpolation and muting section by the</p> <p>ERCO circuit. The interpolation and muting section uses the following methods to correct error found in data stream read from the disc.</p> <ul style="list-style-type: none">• Muting• Last word held• Linear Interpolation <p>Muting: In muting, when error is detected in the data stream , the player will mute (silence)the sound is not to send speaker.</p> <p>CLV using the Clock Signal: The ERCO also responsible for maintaining constant linear velocity of CD rotation motor , For this , The TRCO circuit compare the clock signal derived from the incoming data with reference clock frequency.</p> <p>De- interleaving: Signals from the ERCO contains audio signal in the interleaved format. before doing any further operation on this signal, it must be interleaved. The signal Is then de-interleaved in the interpolation and muting section to restore the original sequence of information.</p> <p>Digital Filter and De-multiplexer: The de-interleaved and regenerated is then send to digital filter and de-multiplexer , where it is filtered and separated in to left and right channel data. This circuit removes any effect of sampling frequency from the data signal , which would appear as interference in the form of aliasing noise in analog signal.</p> <p>Oversampling: During digital filtering oversampling method is used to remove both problems of aliasing noise and quantization error.</p> <p>D/A convertor: The output from digital filter and de-multiplexer circuit is send to D/A convertors. The right and left channels are processed by different D/A convertors. These convertors convert the 16-bit digital signal into the original analog audio signal. Because of the over sampling, done in the digital filter and de-multiplexer circuit simple low-pass filter is used following the D/A process.</p>
d)	Describe the working of dB meter and state its working principle.
Ans:	Principle – 1 mks, diagram- 1 ½ mks, working 1 ½ mks



OR



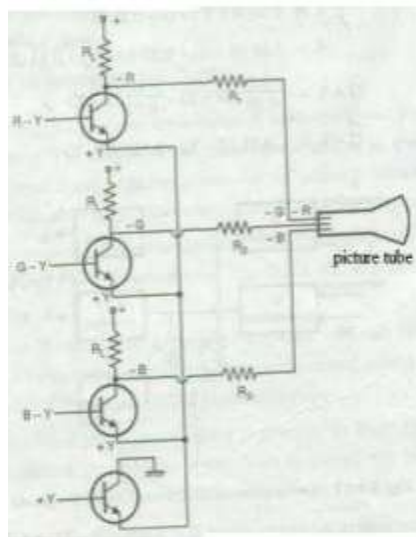
Principle

- The logarithmic term is applied to an electronic voltmeter when the current or voltage produced in the indicating instrument by an applied voltage is proportional to the logarithm of applied voltage
- Such a characteristics leads to a linear decibel scale for the indicating instruments and finds many applications in electronics
- The reading on the meter scale is calibrated in decibels and hence the instrument is called a dB voltmeter or simply dB meter.

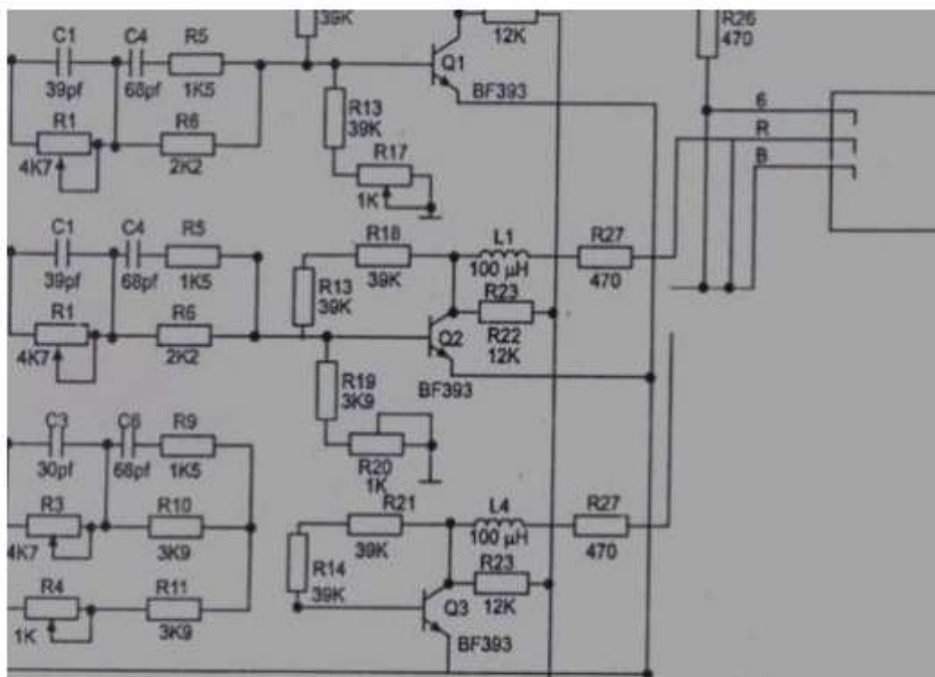
Working

- 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.

B)	Attempt any one:	6
a)	Draw the circuit diagram of RGB drive amplifier and explain it.	
Ans:	Circuit diagram- 3 mks, explanation- 3mks	

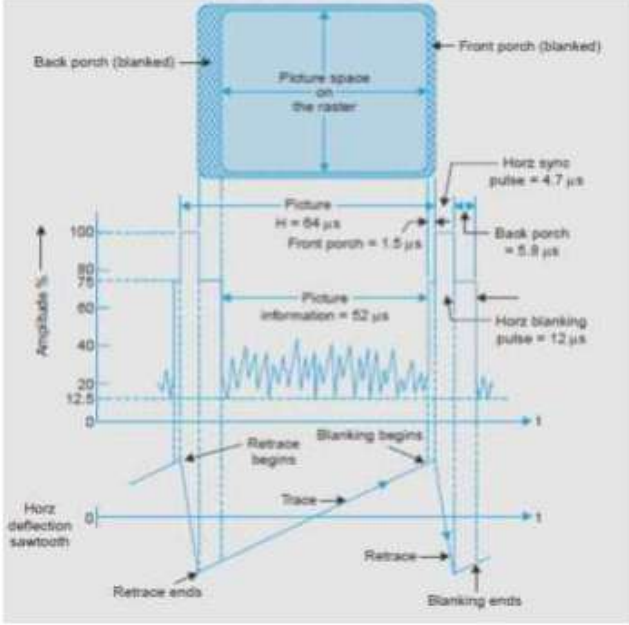


OR



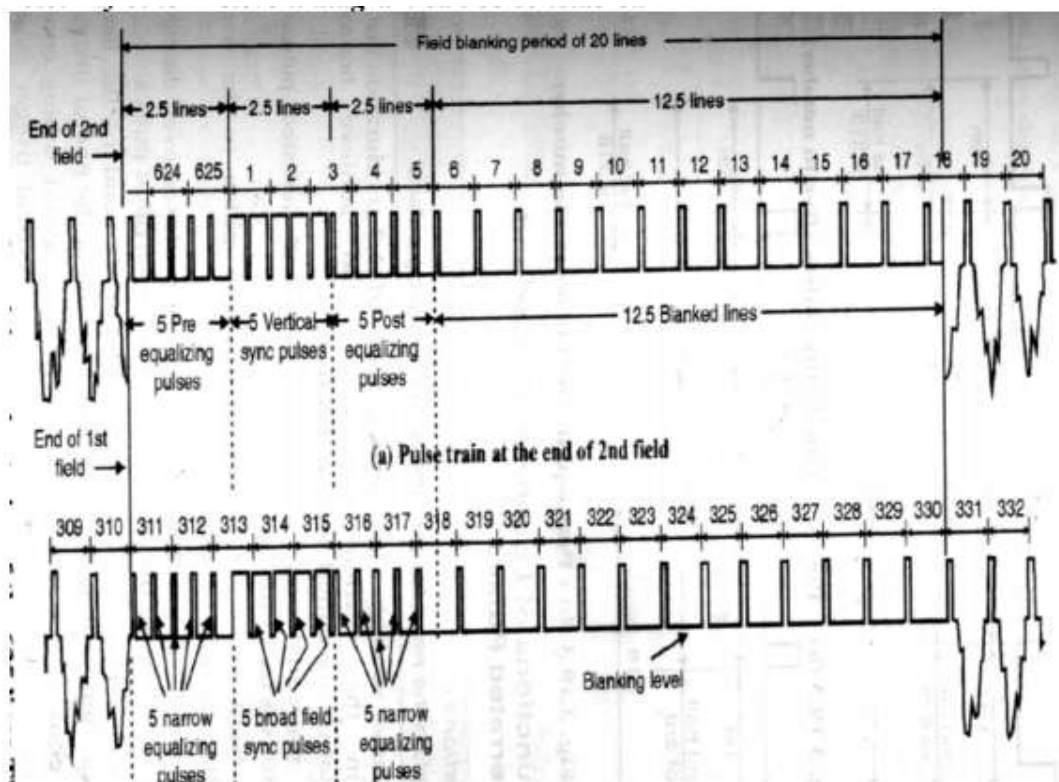
Explanation:

RGB amplifier circuit consists of three identical video amplifiers for driving the 3 cathodes of picture tube. The inputs of amplifiers obtained from the decoded red, green and blue outputs of Chroma IC. Q1, Q2, Q3 are high frequency transistor of type BF393 or BF 869. The 3 amplifiers are of same design so their frequency response is nearly same. 3 amplifiers are identical so only 1 is considered to explain. Q1 of green signal amplifier is connected in CE configuration. 150 V dc supply is filtered by L2 and C9, C7 and C8 are bypass to the emitter supply. R15 and R12 provide negative feedback to improve dc stability. L3 in the collector load used to extend bandwidth. C1 at input to amplifier is to improve step response. The d.c. collector voltage, determines the picture tube cut-off voltage is fixed by R17. R1 is varied for monochrome reproduction at high lights.

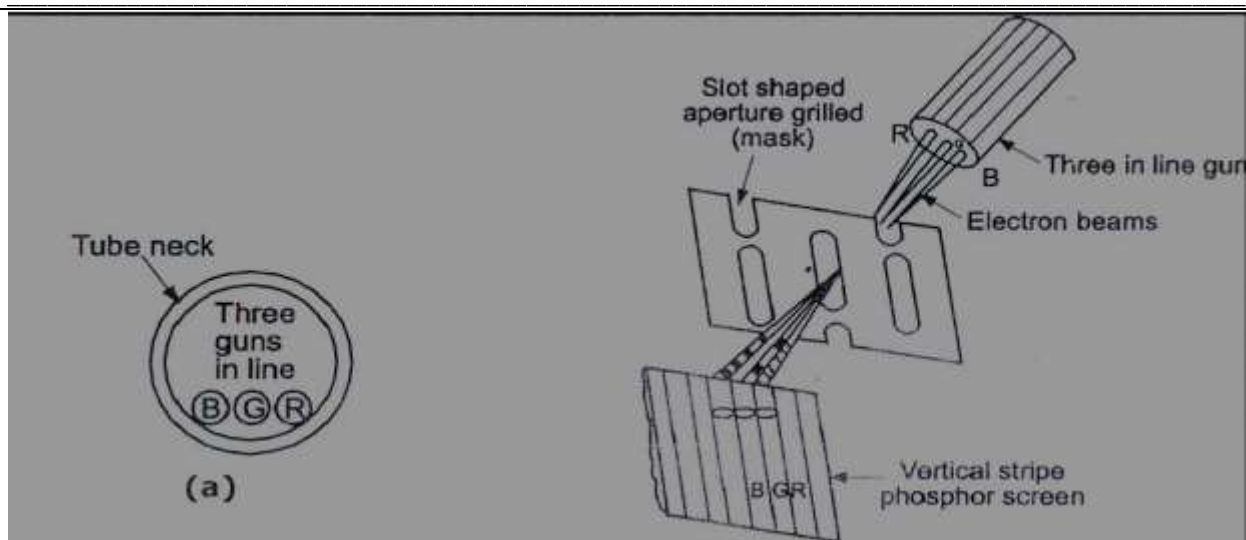
b)	Describe the following terms in TV. i. Horizontal sync pulse details ii) Vertical sync pulse details
Ans:	<p>Diagram- 1½ mks each, explanation -1½ mks each</p> <p>i) Horizontal sync pulse details</p> <p><u>Explanation:-</u></p> <p>Out of a total line period of 64 μs, the line blanking period is 12 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 why in Fig. 3.3 and other figures to follow, all time intervals are shown between sync pulse leading edges.</p> <p>The line blanking period is divided into three sections. These are the 'front porch', the 'line sync' pulse and the 'back porch'. The time intervals allowed to each part are summarized below and their location and effect on the raster is illustrated</p> <div style="text-align: center;">  </div> <p>ii) Vertical sync pulse details</p>

This is a $\frac{1}{2}$ line difference just prior to the start of serrated vertical pulse.

- This $\frac{1}{2}$ 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 $2.3 \mu s$ 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 $4.7 \mu s$ or ($2.3 \mu s$).
- 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.



Q5.	Attempt any two:	16
a)	Describe the working principle of PIL colour picture tube. State its advantages w. r. t trinitron picture tube.	
Ans:	Diagram- 3 mks, working – 3mks, any 2 advantages- 2 mks	



Precision in line picture tube -construction

The overall colour seen is determined both by the intensity of each beam and the phosphors which are being bombarded.

If only one beam is 'ON' and the remaining two are cut-off, dots of only one colour phosphor get excited.

Example, when no transmission then our TV screen shows only blue raster.

Similarly, if one beam is cut-off and the remaining two are kept ON, the rasters produced by excitation of the phosphors of the two colours will combine to create the impression of a complementary colour.

When all the three guns are active simultaneously, lighter shades are produced on the screen.

This is because red, green and blue combine that forms white and this combines with whatever colours are present to de-saturate them.

Naturally, intensity of the colour produced depends on the intensity of beam currents.

Back in a picture is just the absence of excitation when all three colour differences signal to zero, the only signal left to control the three guns would be Y signal and thus a black and white picture will be produced.

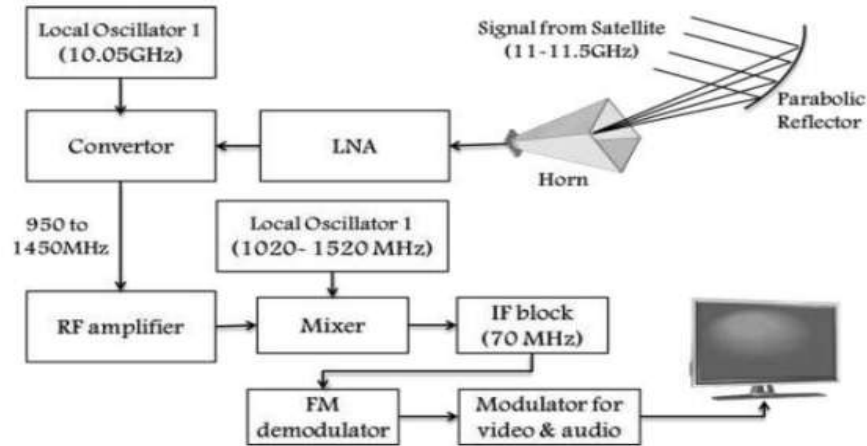
Advantages of Trinitron Picture Tube

1. The grille is easy to manufacture and has greater electron transparency as compared to delta-gun and PIL tubes.
2. Simplifies constructional problems since only one electron gun assembly is to be accommodated
3. Very good resolution over large screen display tubes.

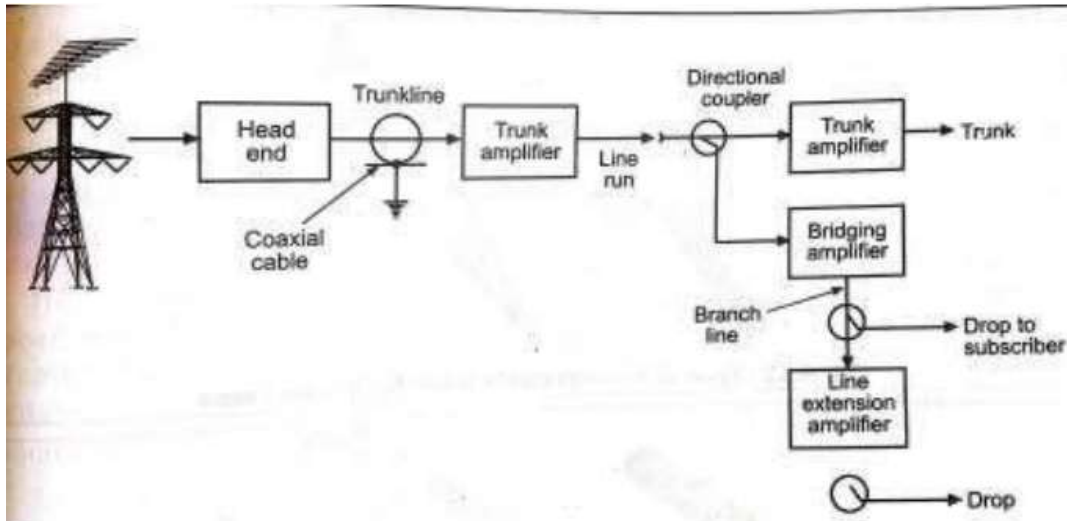
- b) i) Draw the block diagram of DTH system'
ii) Interpret the architecture of cable TV network

i) Block diagram of DTH system

Ans: 4 mks for correct block diagram for each

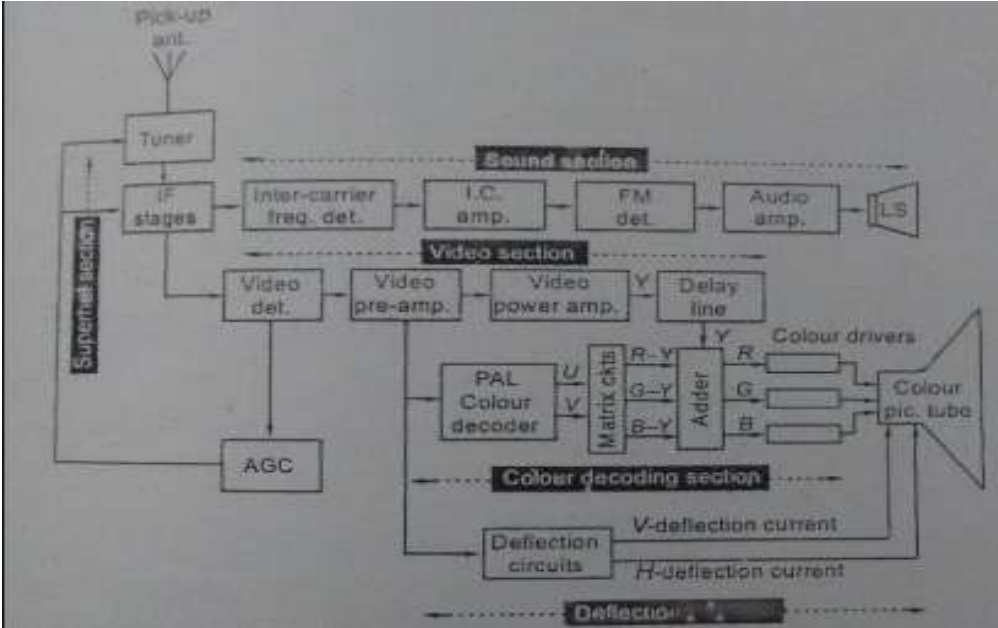


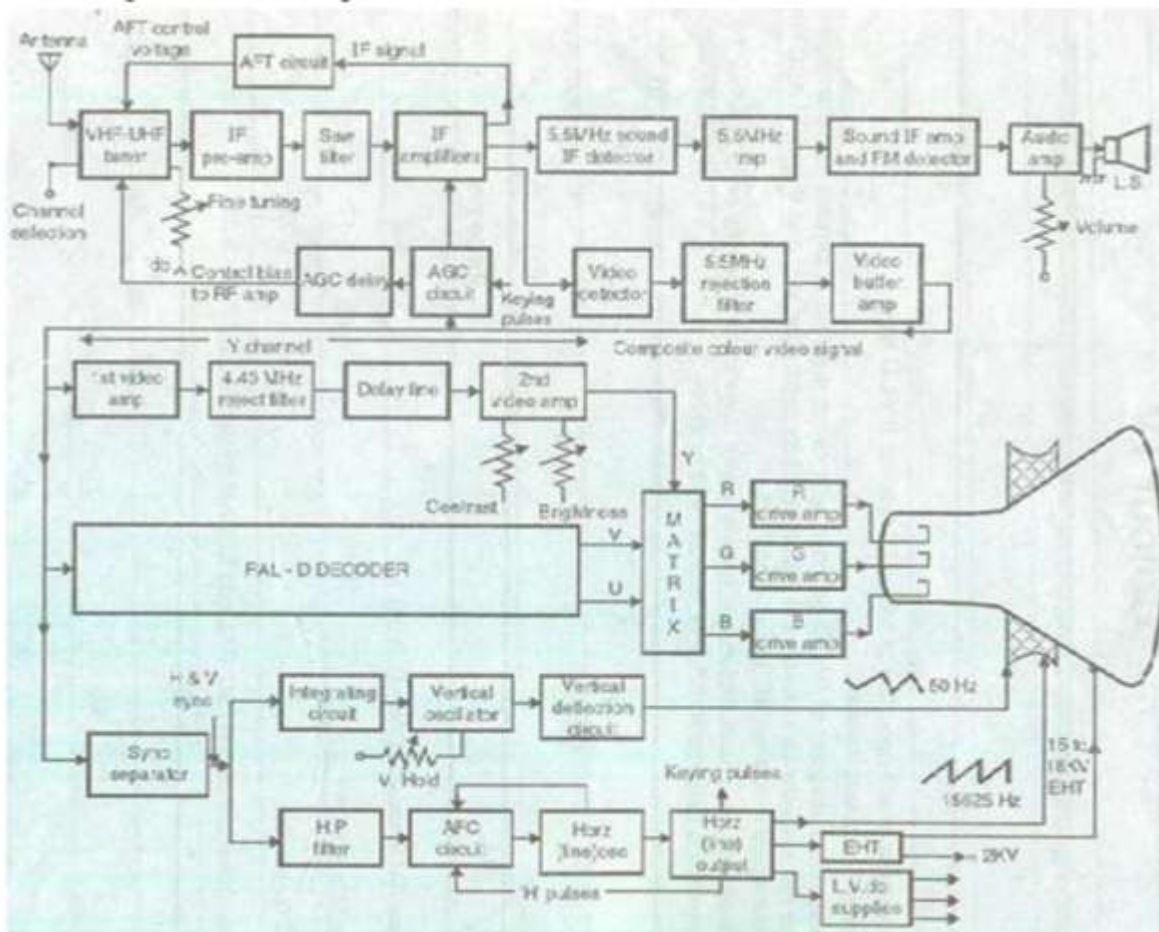
ii) Interpret the architecture of cable TV network (Diagram-2M, Explanation-2M)



Explanation:

1.Trunk amplifier

	<p>2. Bridging amplifier</p> <p>3. Line Amplifier</p> <p>1. Trunk amplifier : There are losses in cable : DC loss , Skin effect loss and dielectric loss. These losses increase in proportion to Square root of frequency. at the high VHF , the loss may be double of loss at low VHF Hence the trunk amplifiers (Gain = 20db to 30db) are inserted at regular intervals along the trunk route to make up for cable losses .</p> <p>2. Bridging amplifier : A bridging amplifier is for a branch from the main trunk to feed a particular neighborhood in the cable system. There is a bridge amplifier to act as a bridge between the trunk line and the branch line it takes care of impedance mismatch caused by the connection with the trunk line and compensates the loss in the trunk line up to the point of connection. Gain of amplifier is 20 to 30 db.</p> <p>3. Line Amplifier: Branch lines are shorter in length, but they also need amplifier of 20 db to 30 db gain at suitable intervals .when a branch line is extended an amplifier becomes necessary and hence, it is also called as line extender.</p>
c)	Draw the block diagram of PAL D type color TV receiver label it well
Ans:	<p>Proper labelled diagram- 8 mks</p>  <p style="text-align: center;">OR</p>



Q6 Attempt any four: 16

a) State CCIR-B standards used for TV system

Ans: Any 8 standards – 4 mks

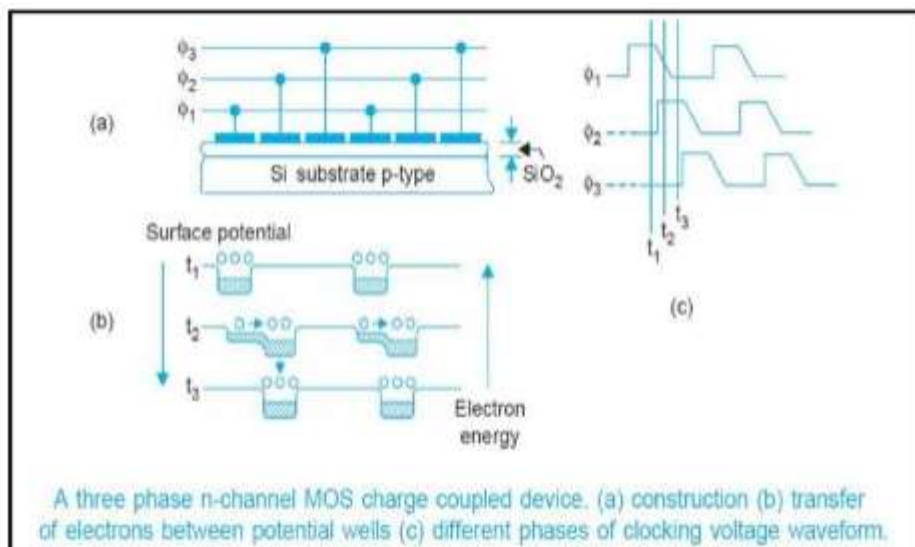
CCIR-B standards used for TV system



<u>Parameters</u>	<u>CCIR B standard</u>
Number of scanning lines/frame	625
Field (vertical) frequency	50Hz
Line(horizontal) frequency	15625Hz
Aspect ratio(width/height)	4:3
Horizontal trace time	52 μ s
Horizontal retrace time	12 μ s
Total scanning line lost in vertical retrace	64 μ s
Front porch	1.5 μ s
Back porch	5.8 μ s
Horizontal sync pulse	4.7 μ s
Colour sub carrier frequency	4.43MHz
Colour system	Phase Alteration by Line –Delay (PAL-D)
U signal(weighted B-Y)	<u>$U=0.493 (B-Y)$</u>
V signal(weighted R-Y)	<u>$V=0.877(R-Y)$</u>
Total vertical blanking duration	1280 μ s or 1.280ms
Vertical sync pulse	160 μ s
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

b) Describe the principle of operation of solid state camera based on CCD

Ans: Diagram- 2 mks, principle/ explanation – 2 mks

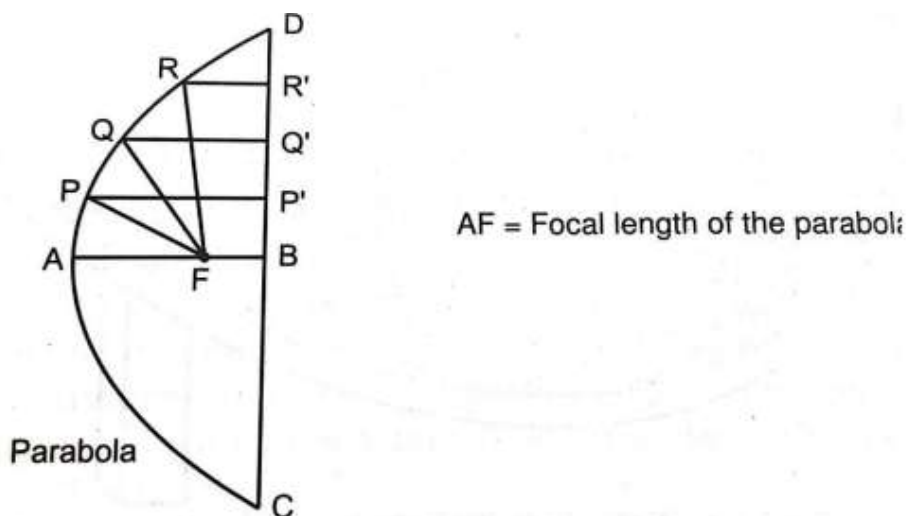


Explanation:-

The operation of solid state image scanners is based on the functioning of charge coupled devices (CCDs) which is a new concept in metal-oxide-semiconductor (MOS) circuitry. The CCD may be thought of to be a shift register formed by a string of very closely spaced MOS capacitors. It can store and transfer analog charge signal either electrons or holes that may be introduced electrically or optically. The constructional details and the manner in which storing and transferring of charge occurs is illustrated in figure below. The chip consists of a p-type substrate, the one side of which is oxidized to form a film of silicon dioxide, which is an insulator. Then by photolithographic processes, similar to those used in miniature integrated circuits an array of metal electrodes, known as gates, is deposited on the insulator film. This results in the creation of a very large number of tiny MOS capacitors on the entire surface of the chip.

c) Draw the constructional details of dish antenna and state its working principle.

Ans: Constructional diagram- 2 mks, working principle – 2 mks





	<ul style="list-style-type: none">• A practical reflector employing the properties of the parabola will be a three dimensional bowl-shaped surface, obtained by revolving the parabola about the axis AB.• The resulting geometric surface is the paraboloid, often called a parabolic reflector or microwave dish.• When it is used for reception exactly the same behaviour is manifested, so that this is also a high gain receiving directional antenna reflector.• The principle of reciprocity which states that the properties of an antenna are independent of whether it is used for transmission or reception.• The reflector is directional for reception because only the rays arriving from BA direction i.e. normal to the directrix are brought together at the focus.• On the other hand, rays from any other direction are canceled at that point, again owing to path length differences.• The reflector provides a high gain because like the mirror of a reflecting telescope, it collects radiation from a large area and concentrates it all at the focal point.																				
d)	Compare between woofer, midrange and tweeter.																				
Ans:	4 relevant points of comparison – 4 mks <table><tr><td>Parameter</td><td>Woofer</td><td>Midrange</td><td>Tweeter</td></tr><tr><td>Defination</td><td>Which covers the low audio frequencies</td><td>Which covers the mid-frequency range of audio</td><td>Which covers high audio frequencies</td></tr><tr><td>Size(or diameter)</td><td>Large</td><td>Medium</td><td>Small</td></tr><tr><td>Weight</td><td>Heavy</td><td>Medium</td><td>Light</td></tr><tr><td>Frequency range</td><td>16Hz to 1 KHz</td><td>500Hz to 5KHz</td><td>5KHz to 16KHz</td></tr></table>	Parameter	Woofer	Midrange	Tweeter	Defination	Which covers the low audio frequencies	Which covers the mid-frequency range of audio	Which covers high audio frequencies	Size(or diameter)	Large	Medium	Small	Weight	Heavy	Medium	Light	Frequency range	16Hz to 1 KHz	500Hz to 5KHz	5KHz to 16KHz
Parameter	Woofer	Midrange	Tweeter																		
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Size(or diameter)	Large	Medium	Small																		
Weight	Heavy	Medium	Light																		
Frequency range	16Hz to 1 KHz	500Hz to 5KHz	5KHz to 16KHz																		
e)	Explain the following terms in colour theory w.r.t. TV: i) Primary colours ii) Secondary colours																				
	Each description – 2 mks i) Primary colours: <ul style="list-style-type: none">• Red, Green and blue are called primary colours• These are basic colours used in TV• The important property of primary colours is that no two primary colours can be combined to produce third primary colour. ii) Secondary colours: <ul style="list-style-type: none">• By pair wise additive mixing of primary colours the complementary of secondary colours are produced. Red+ Green +Blue = White																				



	Red +Green = Yellow Red+ Blue = Magenta(purplish Red) Green + Blue = Cyan(Greenish Blue)
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