Important Instructions to examiners:
1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

Q.1 (A) Attempt any SIX: 12 M

(a) Define the term: Aspect ratio. (2 Mark)

Ans:

Aspect ratio:

Width to height ratio of a picture frame is called as aspect ratio.

(b) State the concept of persistence of vision. (2 Mark)

Ans:

Persistence of vision:

It is the storage characteristics of the human eye. This arises from the fact that the sensation produced when nerves of the eye's retina are stimulated by incident light does not cease immediately after the light is removed but persists for about 1/16th of a second.

Note: any other definition stating same concept marks should be awarded

(c) What is field blanking interval. State its value.

Ans: **(Definition 1 Mark, Value 1 Mark)**

- **Field blanking interval:**

This is the period during which the picture information is completely suppressed, the fly back retrace of the field time base is initiated completed, while the beam is cut off by the black level,

- The duration of field blanking period is 1280 µs.

d) Explain function of serrations in vertical sync pulses.

Ans:

Function of serrations: (2 Mark)

- The function of serrations in the vertical sync pulse is to help maintain the synchronization of H-oscillator.
- In the absence of serrations in V- sync pulse there will be no leading edge for the duration of the V-sync pulse to trigger H- oscillator.
- So the receiver H- oscillator will either lose sync or stop oscillating.
- Depending on design. To maintain continuity in the sequence of line pulses the field sync pulse is split by serrations.

(e)Define Grassman's law.

Ans: Definition: (2 Mark)

The eye is not able to distinguish each of the colours that are mixed to form a new colour but instead, perceives only resultant colour.

Eye perceives new colour depending on the algebraic sum of R, G & B light fluxes. This forms the basis of colours signal generation & known as grassman's law.

f) List the advantages of PAL system.

Ans: Advantages of PAL system. (Any 2 Points, 1 mark each)

- The PAL TV systems have greater resolution than NTSC and are more accepted because of its higher quality
- PAL TV systems, hue errors are automatically removed with the utilization of phase alternation of color signals it receives.
- No need of tint control
- With the help of a 1H delay line that produces lower saturation, the chrominance phase errors that may occur in the PAL system are cancelled out.
- The greatest advantage of the PAL TV system over the NTSC system is that it avoids the NTSC system's sensitivity to phase changes through minor modifications where high color fidelity is achieved.
- With the help of a delay line and two adders, the PAL decoder adds color signals of successive lines while canceling out phase errors.
- Excellent colour stability

(g)Draw a graph showing spectral response of human eye. (2 Mark)

Ans: Diagram:

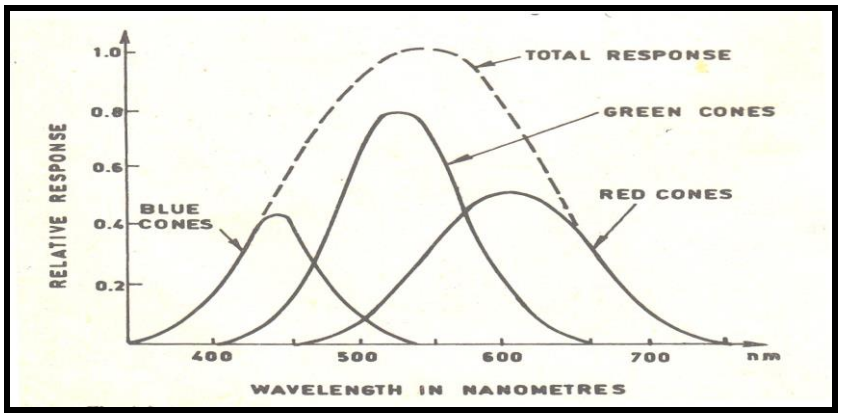
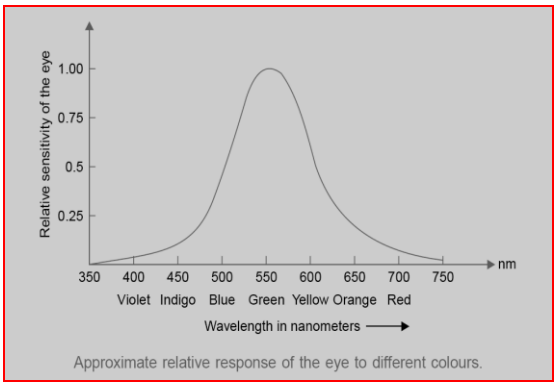


Fig: Spectral response of human eye.

OR



(a) Draw neat sketch of positive & negative AM modulated picture carrier.

Ans:Diagram: (1 Mark each)

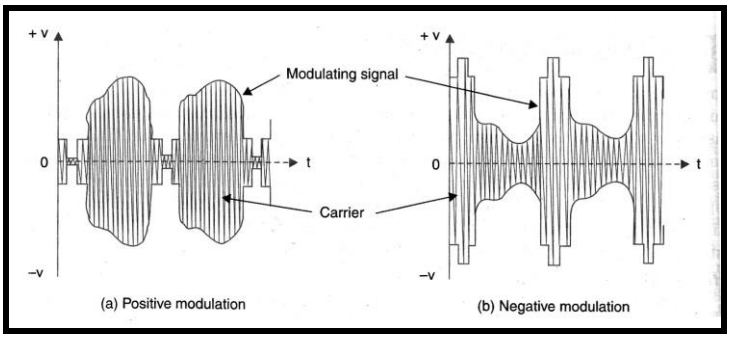


Fig: Positive & Negative AM modulated picture carrier:

(B) Attempt any TWO: 8 M

(a) Draw frequency response curve for vestigial sideband transmission.

Ans:

Diagram: proper neat labeled diagram 8marks

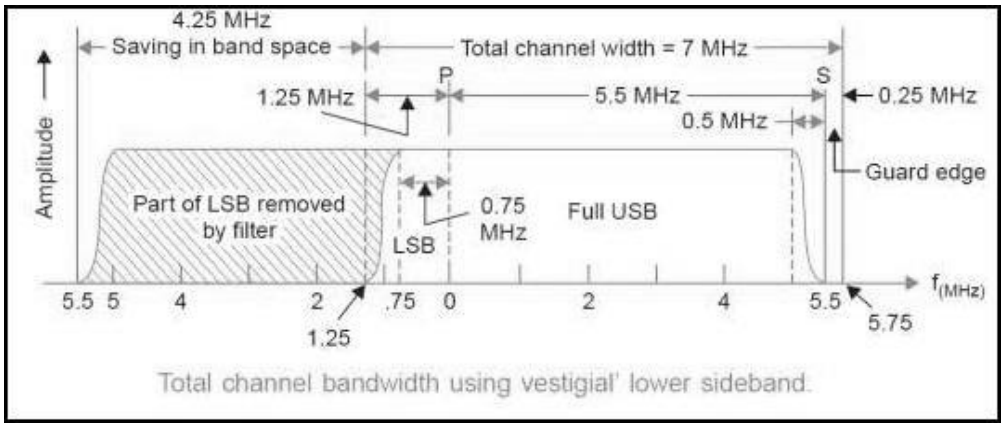


Fig: VSB Transmission:

(b) What is colour burst? Why is it needed? How is it accommodated in picture signal?

Ans:

What is colour burst:- (2 Mark)

- The transmitted signal does not contain the subcarrier frequency but it is necessary to generate it in the receiver with correct frequency and phase relationship for proper detection of the colour sidebands. To ensure this, a short sample of the subcarrier oscillator, (8 to 11 cycles) **called the —colour burst** is sent to the receiver along with sync signals. Subcarrier frequency is 4.43MHz.

Why is it needed:- (2 Mark)

- The colour burst is gated out at the receiver and is used in conjunction with a phase comparator circuit **to lock** the local subcarrier oscillator frequency and phase with that at the transmitter.

Accommodated in picture signal :- **(2 Mark)**

- As the burst signal must maintain a constant phase relationship with the scanning signals to ensure proper frequency interleaving, the horizontal and vertical sync pulses are also derived from the subcarrier through frequency divider circuits.

Diagram:- (2 Mark)

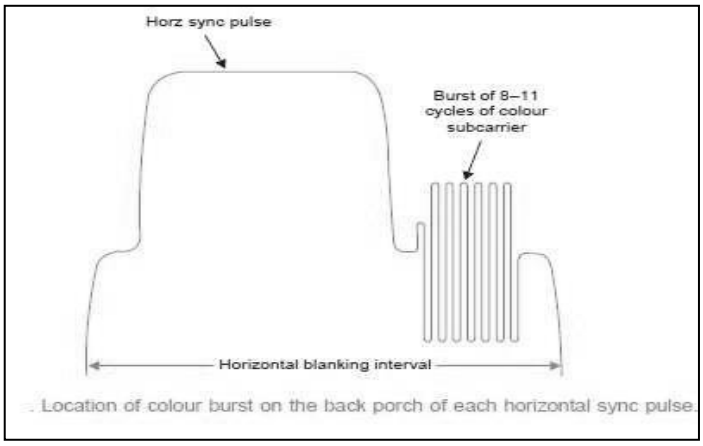


Fig. Colour burst signal

(c) Draw block diagram of colour T.V. camera tube and describe its function.

Ans: (Explanation 2 M, Diagram: 2 Mark)

Diagram:

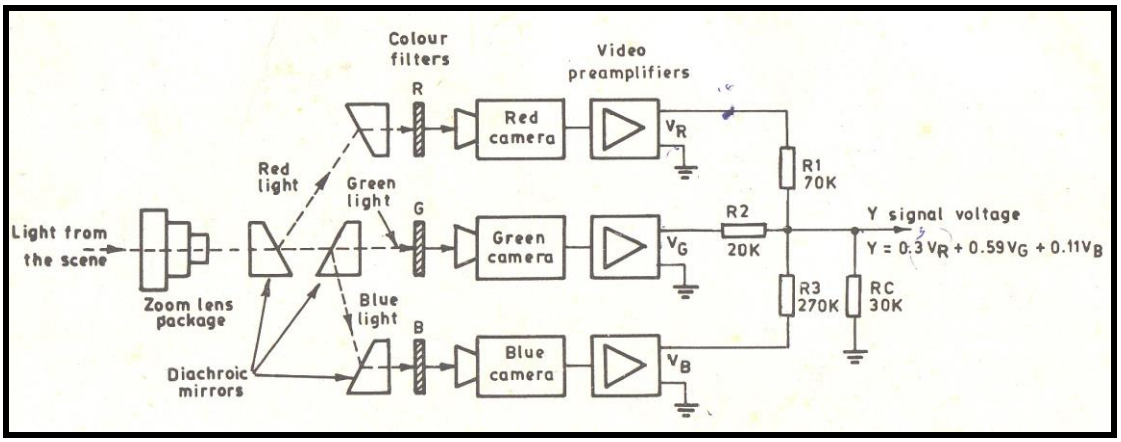


Fig: Colour T.V. camera tube

Function of each blocks: 2M

- It consists of three monochrome camera tube systems
- Each camera tube receives selectively filtered primary colours to produce electrical signal proportional to the respective colour.
- Light from the scene processed by the objective lens is directed at an arrangement of mirrors that splits the light into the three basic colours Red, Green and Blue.
- The mirrors are coated with special dichroic material so that they reflect a specific colour and allow other spectral frequencies to pass through.

- Thus original image is split into three constituent colour shades.
- These three coloured lights are focussed on the face plates of three separate camera tubes. They are made responsive to the respective colours by means of supplementary filters.

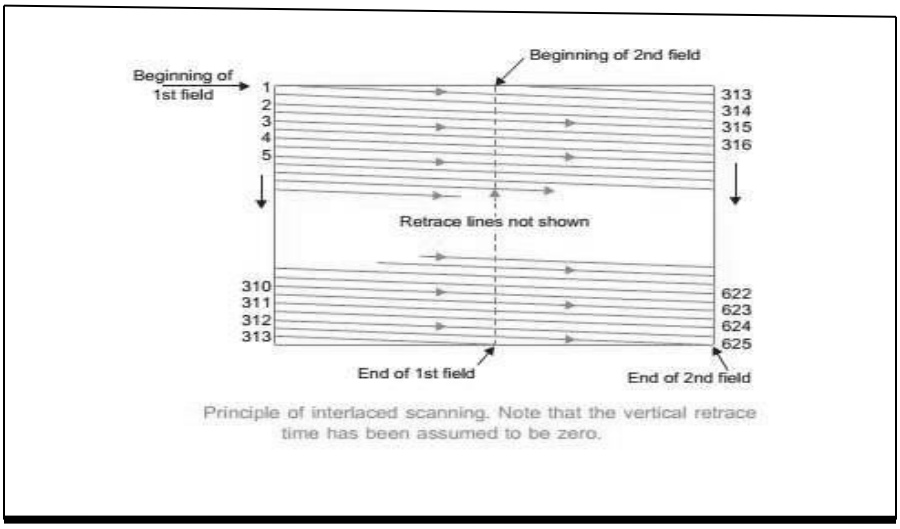
  Outputs from all three camera tubes are amplified separately and combined by the resistor matrix to obtain colour video signal

Q.2 Attempt any FOUR: 16M

(a) What is interlaced scanning ? How flickers are eliminated using it ?

Ans: (Interlaced scanning: 2 Marks, Eliminated of flickers: 2 Marks)

Interlaced scanning:



Principle of interlaced scanning. Note that the vertical retrace time has been assumed to be zero.

- T.V. pictures an effective rate of 50 vertical scans per second is utilized to reduce flicker.
- Total numbers of lines are divided in to two groups called fields (even and odd).
- In T.V. pictures an effective rate of 50 vertical scans per second is utilized to reduce flicker.
- Total numbers of lines are divided in to two groups called fields (even and odd).

Eliminated of flickers:

- In interlaced scanning each frame is divided into two fields.
- Each field is obtained by interlacing the horizontal scanning lines into the group fields. One with odd numbered lines & one with even numbered lines. They are called odd and even fields respectively.
- The reception rate is so per second. As two fields are scanned during one frame period of 1/25 second.
- Thus 50 views of picture are shown during one section.
- This fast repetition rate reduces flickers.

(b) Explain pedestal height with neat diagram.

Ans: **(Diagram 2 Marks, Explanation : 2Marks)**

Diagram:

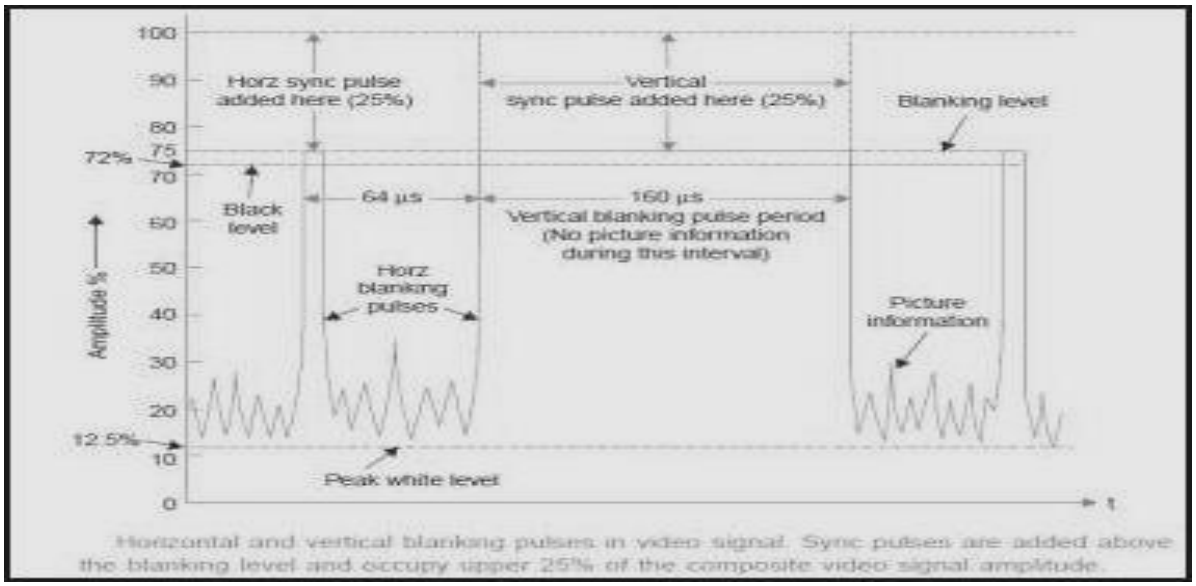
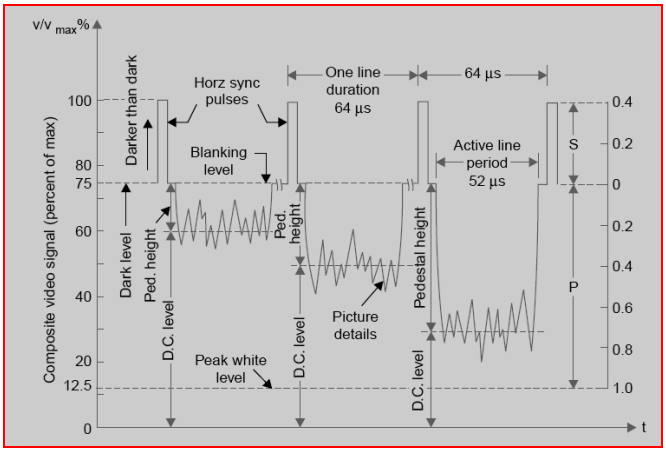


Fig. Pedestal height

OR



Pedestal height: **1M**

- 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.
- The output signal from TV camera is of very small amplitude. Hence, it is amplified by multistage high gain amplifiers. Sync and blanking pulses are added to it and then signal is clipped at proper value to form pedestal.
- Pedestal height determines brightness of scene. Large pedestal height makes picture brighter and vice versa. Operator who observes the picture in studio adjusts level for desired brightness by adding dc component to ac signal.

c) Explain working of vidicon camera tube with neat diagram.

Ans: (Diagram 2 Marks, Working : 2Marks)

Diagram:

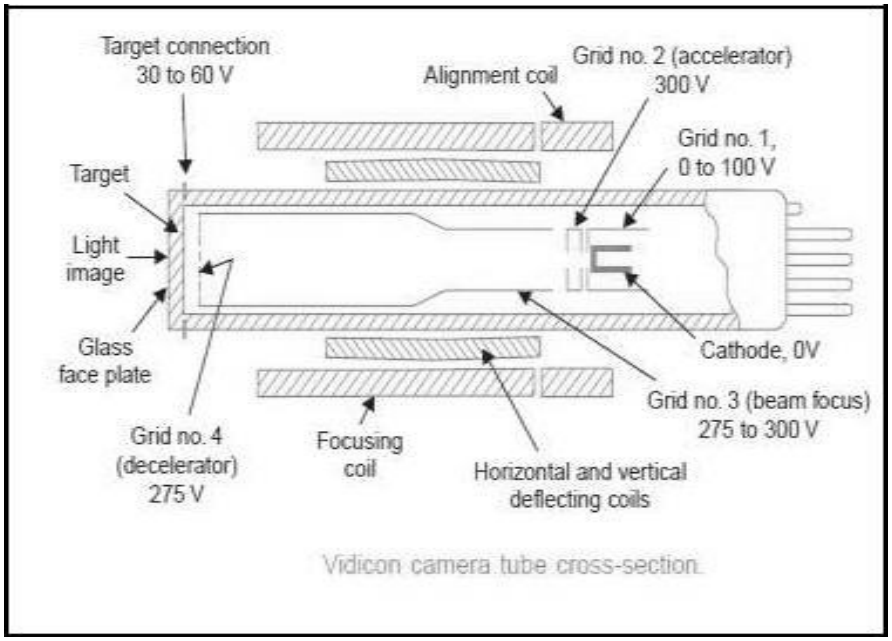


Fig: Vidicon camera tube

Working:

- Light from the scene is focused by an optical lens on to vidicon target. Light passes through the glass face place & internal conductive surface to photoconductive image plate that is scanned by electron beam. The resulting camera signal is taken from the target ring image end of photo conductive target is connected to DC supply (40V).

- In absence of light, the photo conductive layers behaves as an insulator. When light falls on it, e;lectrons from conduction level of atoms becomes free. Therefore change image is formed.

- When low energy electron beam sweeps past each picture element of target plate, it deposits just enough electrons on target plate to discharge each point to zero potential. Therefore discharge current flows through R_L. This is camera output signal.

(c) With the help of appropriate sketch, explain why and how interleaving is done in colour transmission.

Ans: (Diagram 2 Marks, Explanation : 2Marks)

Diagram:

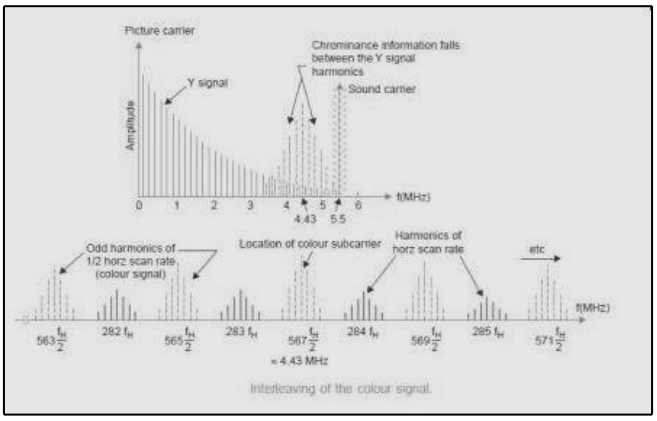


Fig. Interleaving of colour transmission

Explanation: **2M**

When picture carrier is modulated by luminance signal at line frequency 15625Hz, the video signal is not continuous one. It consists of clusters of energy located around harmonics at frame frequency (25Hz,50Hz). Thus individual clusters are separated by wide gap, which can be used to accommodate colour information. This process of accommodating information of one signal in gap occurring in other signal is called frequency interleaving.

(d) Explain the different factors which influence the choice of colour subcarrier in PAL TV system.

Ans:[any four factors -1marks each]

Explanation:

- The picture carrier and the colour subcarrier should be located quite apart from each other to avoid any beat interference between the two signals due to some overlaps and imperfect frequency interleaving. It can be minimized by placing the chroma signal near high frequency end of the Y signal spectrum.
- The chroma signal lies in the pass-band of luminance signal and can thus reach the picture tube input of a B & W receiver.
- Some dot pattering may appear on the colour subcarrier along with the Y signal. This effect can again be reduced by choosing a higher subcarrier frequency.
- f_{sc} can not be chosen for the following reasons:

1. Keeping the subcarrier very high would mean single sideband transmission of the chroma signal with the consequent increase in receiver design complexity. The chroma signal requires at least a bandwidth of 2 MHz centered on the subcarrier. Thus, if both the sidebands are to be fully accommodated, the highest possible value of $f_{sc\ is}$ around 4 MHz.

2. A very high subcarrier will bring it too close to the sound signal spectrum and cause another type of interference due to mutual interference.

3. It is technically difficult to obtain reasonably linear phase characteristics near the cut-off point of the video bandwidth. A higher values of f_{sc} would place the complex chroma signal in this region causing its distortion. Any phase shift of the chroma signal affects hues and hence too high a value of f_{sc} is not desirable.

(e) Draw block diagram and explain working of HDTV transmitter.

Ans: **(Note:- Any of the below diagram can be considered ,diagram-2M,explanation-2M)**

Diagram:

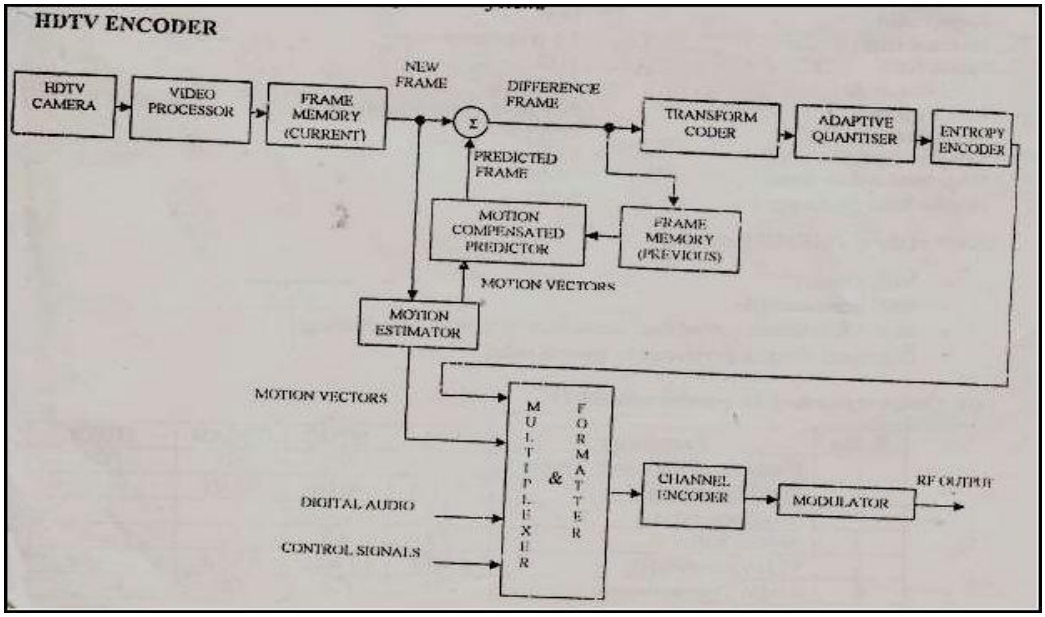


Fig: HDTV transmitter

Basic Operation

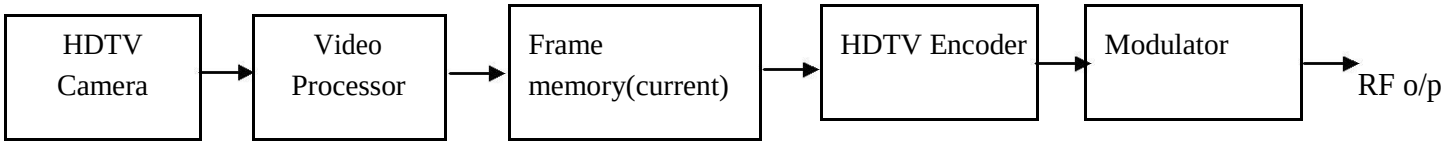
- A frame of the input video signal (output stored of the HDTV camera) after being suitably processed is in the frame memory (current) and referred to as new frame.
- A predicted frame is generated by past frames accumulated in the frame memory (previous).
- A difference frame is obtained by subtracting the predicted frame from the new frame. since the predicted frame closely represents the new frame, there is little information left to be transmitted in the difference frame. this is the first step in video compression.
- Further compression, of the video signal is achieved by using:
    - a transform coder
    - Entropy encoding which takes advantage of redundancy in the signal obtained at the output of the

transform coder.

- The coded signals along with the digital audio & control signals are multiplexed.
- To take care of error during transmission the output of the multiplexer is passed through the channel encoder.
- This is the final signal which feeds the modulator.

Note:- Video information typically remains un changes from frame to frame, except for some displacement owing

OR



Q.3 Attempt any FOUR: 16M

a) What is kell factor? How does it affect vertical resolution of T.V signal?

Ans: **(Definition: 2Marks, Explanation:2Marks)**

Kell factor:

The factor indicating the reduction in effective number of lines is called as 'Kell factor'

Explanation:

What the kell factor indicates is that it is unrealistic to state that the vertical resolution is equal to the number of active lines.

In a picture, not all lines or parts of lines are fully effective at all times.

The number of active lines multiplied by the kell factor leads to a smaller figure for a more realistic assessment of available vertical resolution.

b) Define the terms:

i) Brightness

ii) Contrast

iii) Viewing distance

iv) Luminance

Ans: (each definition-1Mark)

Brightness:

This is the amount of light intensity as perceived by the eye regardless of the colour. In black and white pictures, better lighted parts have more luminance than the dark areas.

Contrast:

This is the difference in intensity between black and white parts of the picture over and above the brightness level.

Viewing distance:

Viewing distance is the distance that provides the viewer with the optimum immersive visual experience.

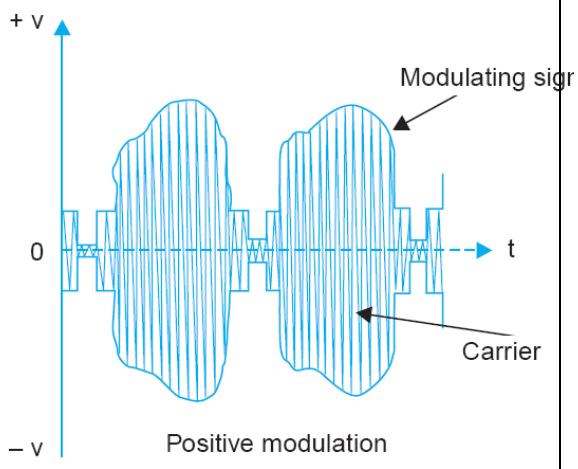
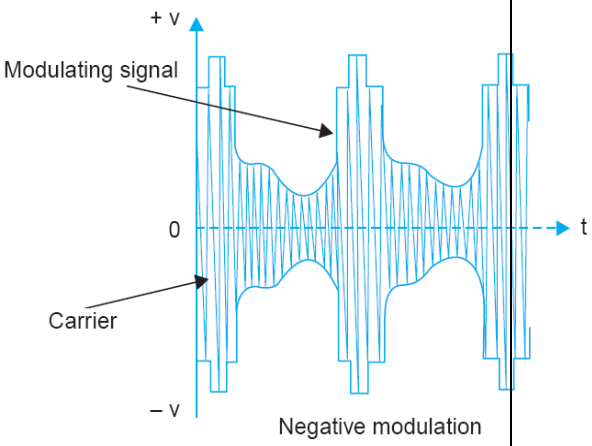
- The viewing distance from the screen of the TV receiver should not be so large that the eye cannot resolve details of the picture. The distance should also not be so small that picture elements become separately visible. The above conditions are met when the vertical picture size subtends an angle of approximately 15° at the eye.
- Most people prefer a distance close to five times the picture height.

Luminance

This is the amount of light intensity as perceived by the eye regardless of the colour. In black and white pictures, better lighted parts have more luminance than the dark areas.

c) Compare positive and negative modulated amplitude modulated signals. (4 points)

Ans: (4 points-4marks)

Sr.No	Positive Modulation	Negative Modulation
1.	When increase in brightness of that picture results in an increase of the amplitude of modulated envelope.it is called positive modulation.	When increase in brightness reduces amplitude of the modulated envelope, it is called negative modulation.
2.	White level of video signal corresponds to 100% total magnitude.	White level of video signal correspondence to 12.5% of the total amplitude.
4.	Noise pulses do not effect synchronization but cause white spot in the picture	Noise pulses are seen as less annoying black spot.
5.	More power is required with less efficiency	If peak power available from transmitter is considered them less power is required for more efficiency.
6.	Black level of video signal correspondence to 25% of total magnitude.	Blanking level starts at 75%
7.		

d) List features and characteristics of HDTV signal.

Ans: (any 2 features- 1Marks each, any 2 characteristics -1Marks each)

Features and characteristics of HDTV signal:

- Improvement in both vertical and horizontal resolution of the reproduced picture by approximately 2:1 over existing standards
- Much improved colour rendition (reproduction).
- Higher aspect ratio of at least 5:3.
- Stereophonic sound.
- Their implementation results in a picture quality as clear as obtained from 35 mm cine films and sound as good as from digital audio discs.
- 1125 scanning lines per frame.
- 60 fields per second.
- 2:1 interlace scan.
- Aspect ratio 16:9.
- Bandwidth 10MHz.

e) Explain how differential phase error is eliminated in PAL TV system.

Ans: (Diagram:2 Marks, Explanation:2M)

Diagram:

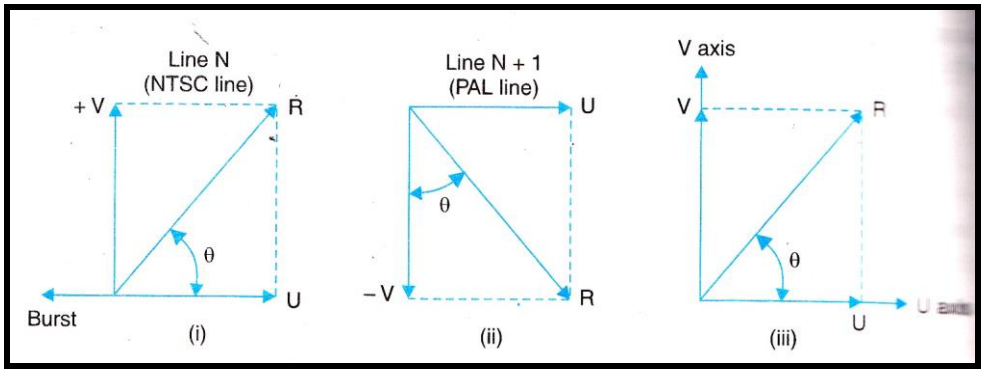


Fig: Differential phase error

Explanation:

- The chroma signal is susceptible
- to phase shift errors both at the transmitter and in the transmission path.
- This effect is sometimes called 'Differential phase error' and its presence results in changes of hue in the reproduced picture.
- This actually results from a phase shift of the colour sideband frequencies with respect to colour burst phase.
- The PAL system has a built-in protection against such errors provided the picture content remains almost the same from line to line.
- This is illustrated by phasor diagrams.
- Fig shows phasors representing particular U and V chroma amplitudes for two consecutive lines of a field.
- Since there is no phase error the resultant phasor(R) has the same amplitude on both the lines.
- Detection along the U axis in one synchronous detector and along the V axis in another, accompanied by sign switching in the latter case yields the required U and V colour signals. Thus correct hues are produced in the picture.

f) List advantages and disadvantages of digital T.V. system. (2 each)

Ans: (Advantages any 4 points -2Marks , disadvantages -2Marks)

Advantages:

- Reduced ghost images.
- Reduction of 50Hz flicker.
- High resolution pictures.
- Slow motion action.
- Easy adoption to additional displays.
- Reduced operational instability.

Disadvantages:

- The biggest disadvantage of the digital TV is the fact that you will need special equipment called digital converter box.
- In digital broadcast there is the loss of signals because of bad weather.
- It can be quite difficult to adjust the antenna (without special equipment e.g. signal level meter).
- Switching channels is slower because of the time delays in decoding digital signals.

Q.4 Attempt any FOUR: 16M

a) Explain the term: Horizontal and Vertical resolution.

Ans: (Horizontal resolution: 2Marks, Vertical resolution: 2Marks)

Definition:

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

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

Thus, vertical resolution can be expressed as,

$$V_r = N_a \times k$$

Vr = Vertical resolution

Na = Active number of lines.

K-kell factor or resolution factor

Horizontal Resolution:

Definition:

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

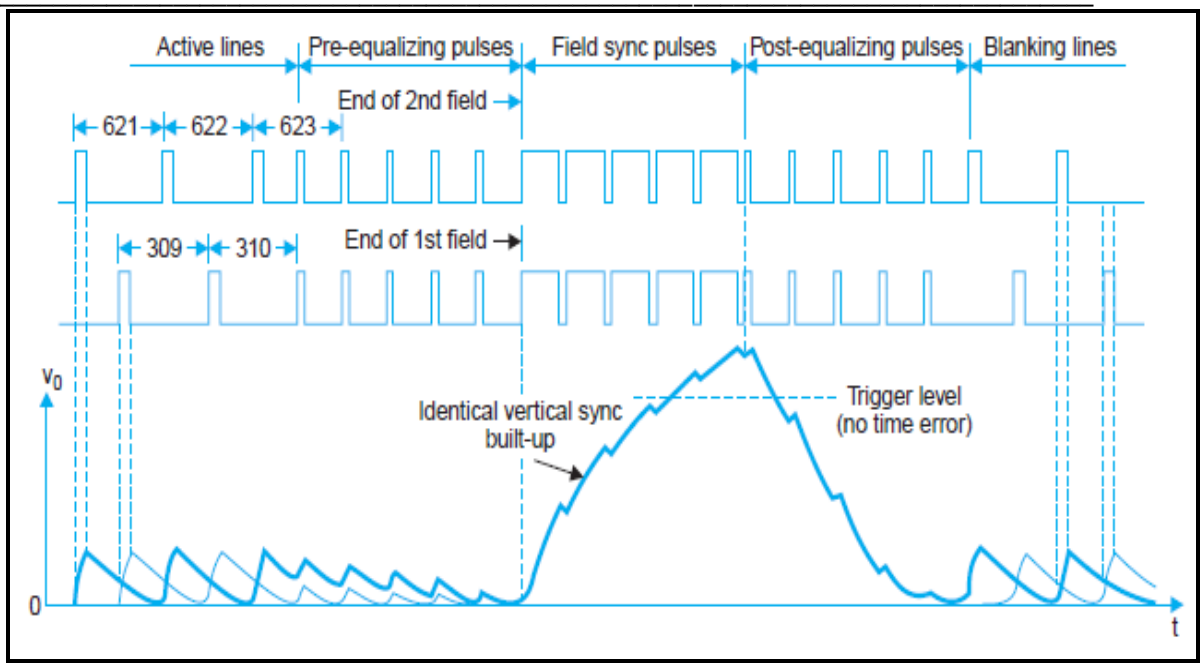
1) While aiming at equal vertical and horizontal resolutions and assuming the same Kell factors the effective number of alternate black and white segments (N) that get scanned in one horizontal line are-

$$N = N_a \times Aspect\ Ratio \times k$$

b) Explain the need of adding equalizing pulses in CVS. Where are they added?

Ans: (Explanation-4Marks)

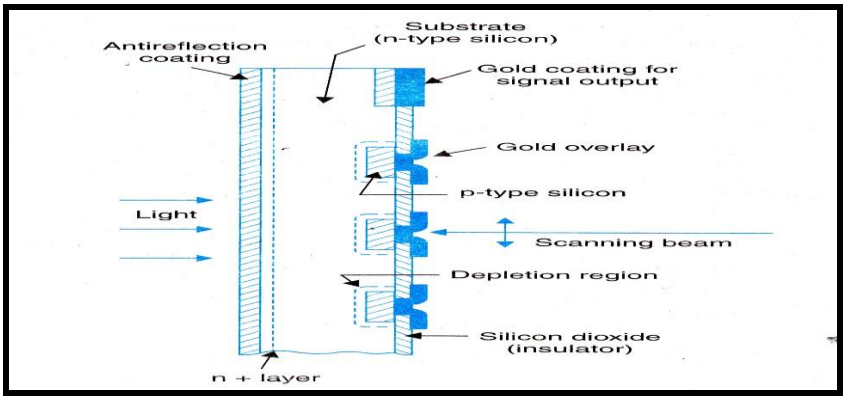
- The inequality in potential levels for the two fields continues during the period of discharge of the capacitor once the vertical sync pulses are over and the horizontal sync pulses take-over.
- To take care of this drawback which occurs on account of the half line discrepancy five narrow pulses are added on either side of the vertical sync pulses. These are known as pre-equalizing and post-equalizing pulses.
- Each set consists of **five narrow pulses occupying 2.5 lines period** on either side of the vertical sync pulses. Pre-equalizing and post equalizing pulse details with line numbers occupied by them in each field are given in Fig.



- The effect of these pulses is to shift the half-line discrepancy away both from the beginning and end of vertical sync pulses.
- Pre-equalizing pulses being of 2.3 μs duration result in the discharge of the capacitor to essentially zero voltage in both the fields, despite the half-line discrepancy before the voltage build-up starts with the arrival of vertical sync pulses.
- Post-equalizing pulses are necessary for a fast discharge of the capacitor to ensure triggering of the vertical oscillator at proper time. If the decay of voltage across the capacitor is slow as would happen in the absence of post-equalizing pulses, the oscillator may trigger at the trailing edge which may be far-away from the leading edge and this could lead to an error in triggering.

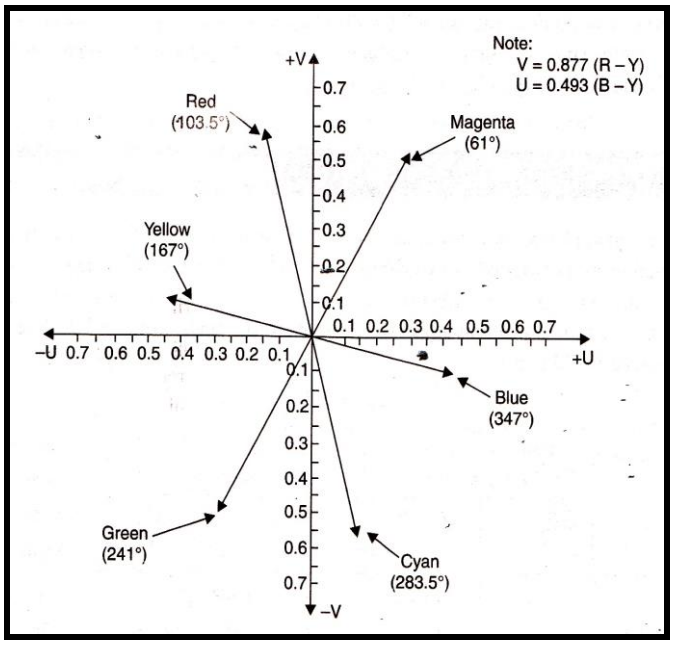
c) Draw neat block diagram of silicon diode array camera tube.

Ans: (Diagram: 4marks)



d) Draw neat phaser diagram of weighted primary and secondary colours.

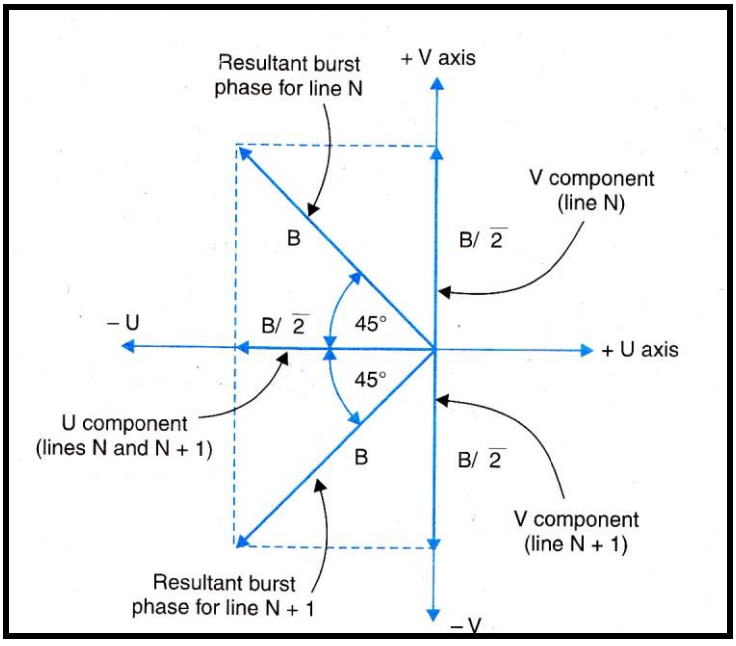
Ans: (Diagram: 4marks)



e) Why burst signal in PAL TV is called swinging colour burst?

Ans: (Diagram: 2Marks, Explanation: 2Marks)

Diagram:



Explanation:

- In PAL TV the (B-Y) output would be U as required but the (R-Y) putput would alternate as +V and –V from line to line.
- The demodulator must be switched at half the horizontal (line) frequency rate to give '+V' only on all successive lines
- Its function to synchronize the receiver colour oscillate for reinsertion of the correct carrier into the U and V demodulators
- In PAL TV the burst phase phase actually swings $\pm 45^0$ about the –(B-Y).axis from line to line.
- However the sign of (R-Y) burst component indicates the same sign as that of the (R-Y) picture signal.
- Thus the necessary switching mode information is always available.
- Since the colour burst shifts on alternate lines, by $\pm 45^0$ about the zero reference it is often called the swinging burst.

f) Compare standard colour TV system (PAL) with HDTV system. (4 points)

Ans: (4 Points: 4 Marks)

Comparison:

	NTSC	PAL
Video Bandwidth	4.2 MHz	5.0 MHz
Sound Carrier	4.5 MHz	5.5 MHz
Bandwidth	6 MHz	7 to 8 MHz
Vertical Frequency	60 Hz	50 Hz
Horizontal Frequency	15.734 kHz	15.625 kHz
Color Subcarrier Frequency	3.579545 MHz	4.433618 MHz
Lines/Field	525/60	625/50

Q5. Attempt any FOUR of following: 16M

a) With the help of labeled sketch for internal construction, explain how human eye perceives brightness & colour.

Ans: **(Diagram: 2Marks, Explanation: 2Marks)**
(Note: Any other relevant diagram should be considered)

Diagram:

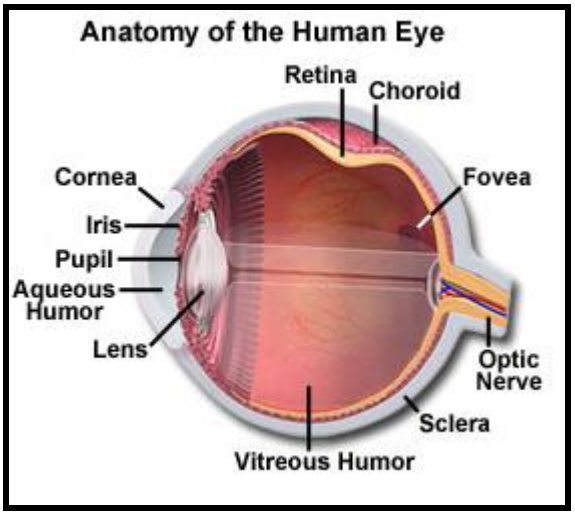


Fig. Human eye

Explanation:

Vision involves the nearly simultaneous interaction of the two eyes and the brain through a network of neurons, receptors, and other specialized cells.
The first steps in this sensory process are the stimulation of light receptors in the eyes, conversion of the light stimuli or images into signals, and transmission of electrical signals containing the vision information from each eye to the brain through the **optic nerves**.
This information is processed in several stages, ultimately reaching the **visual cortices** of the cerebrum.

b) Write CCIR-B standards. (any 8)

Ans: (Any 8, ½ Mark each)

Camera output	R, G, and B video signals
Luminance signals	Y=0.30R+0.59G +0.11B
Colour difference signals chosen for transmission	(B-Y) and(R-Y)
Type of colour signal modulation	Suppressed carrier amplitude modulation Of two subcarriers in quadrature having same numerical value.
Colour difference signals	U=0.493(B-Y) V=0.877(R-Y)
Composite colour signal	Y+U sin ωm t+-Vcos ωmt
Amplitude of modulated Chroma signal	u2+v2
Colour subcarrier frequency	4.433185 MHz
Duration of burst	10+1
Chroma encoding	Phase and amplitude modulation
Bandwidth for colour signals (u and v)	Fsc-1.3 MHz to fsc+0.6 MHz
No. of lines per picture (frame)	625
Field frequency (Fields/second)	50
Interlace ratio, i.e., No. of fields/picture	2/1
Picture (frame) frequency, i.e., Pictures/second	25

Line frequency and tolerance in lines/second,(when operated non-synchronously)	15625 ± 0.1%
Aspect Ratio (width/height)	4/3
Scanning sequence	(i) Line: Left to right (ii) Field: Top to bottom
System capable of operating independently of power supply frequency	YES
Approximate gamma of picture signal	0.5
Nominal video bandwidth, i.e., highest video modulating frequency (MHz)	5
Nominal Radio frequency bandwidth, i.e., channel bandwidth (MHz)	7
Sound carrier relative to vision carrier (MHz)	+5.5
Sound carrier relative to nearest edge of channel (MHz)	– 0.25
Nearest edge of channel relative to picture carrier (MHz)	–1.25
Fully radiated sideband	Upper
Nominal width of main sideband (upper) (MHz)	5
Width of end-slope of full (Main) sideband (MHz)	0.5
Nominal width of vestigial sideband (MHz)	0.75
Vestigial (attenuated) sideband	Lower

c) Draw the block diagram of monochrome TV transmitter.

Ans: **(Diagram :4Marks)**

Note: Any other relevant diagram should be considered

Diagram:

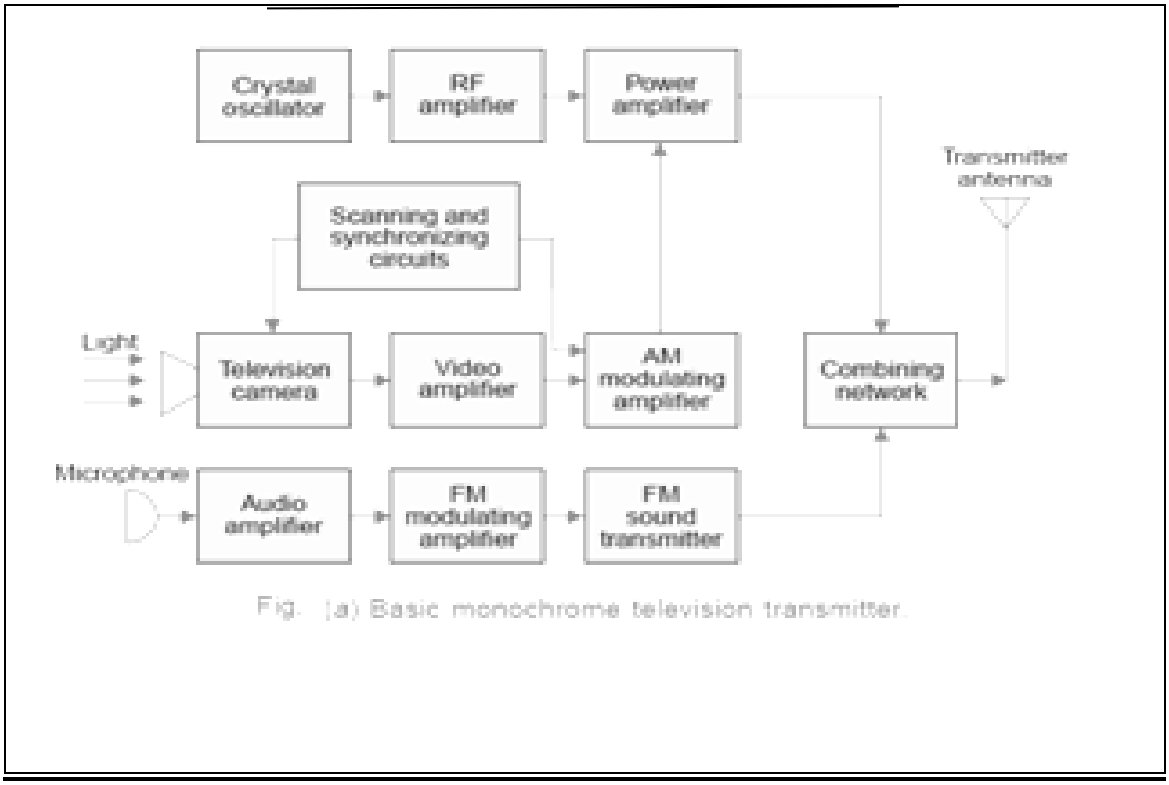
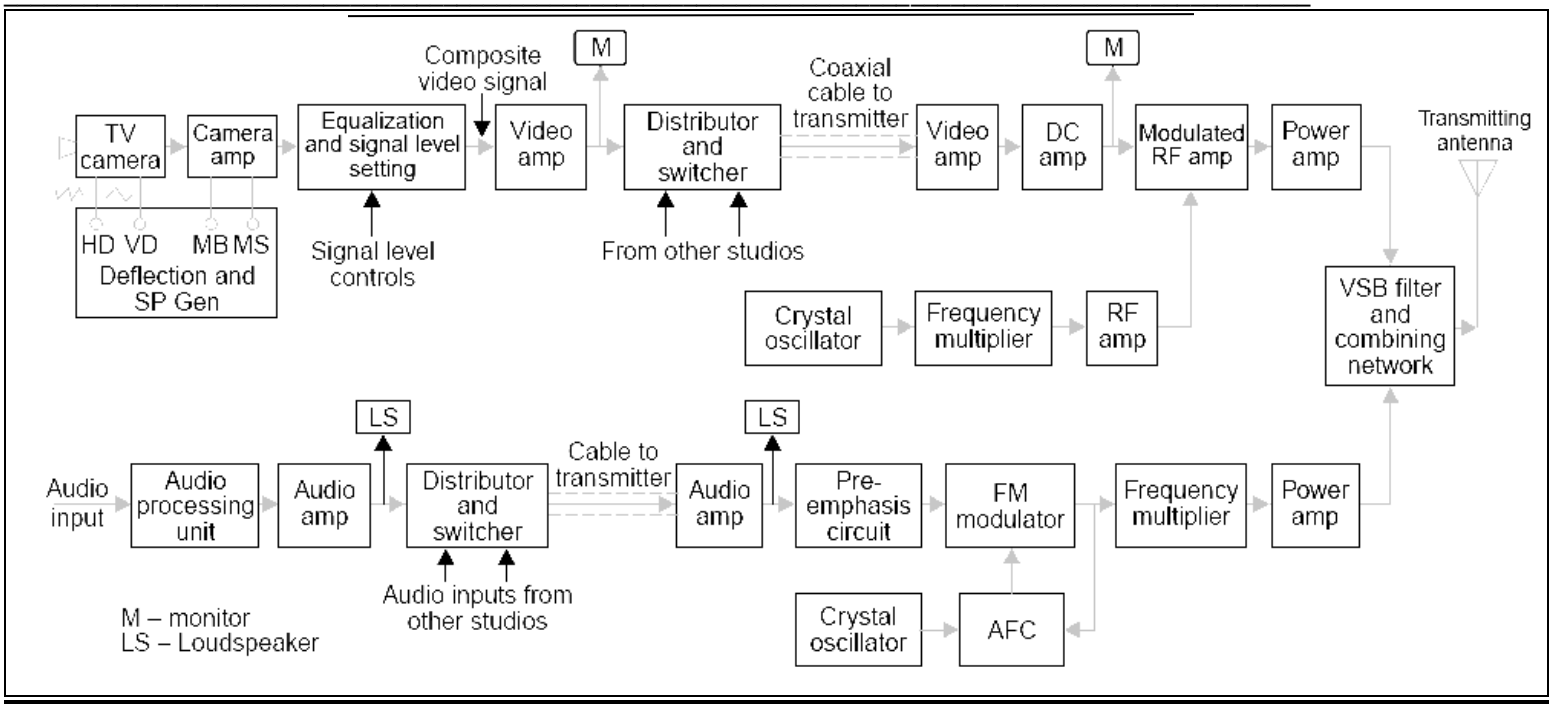
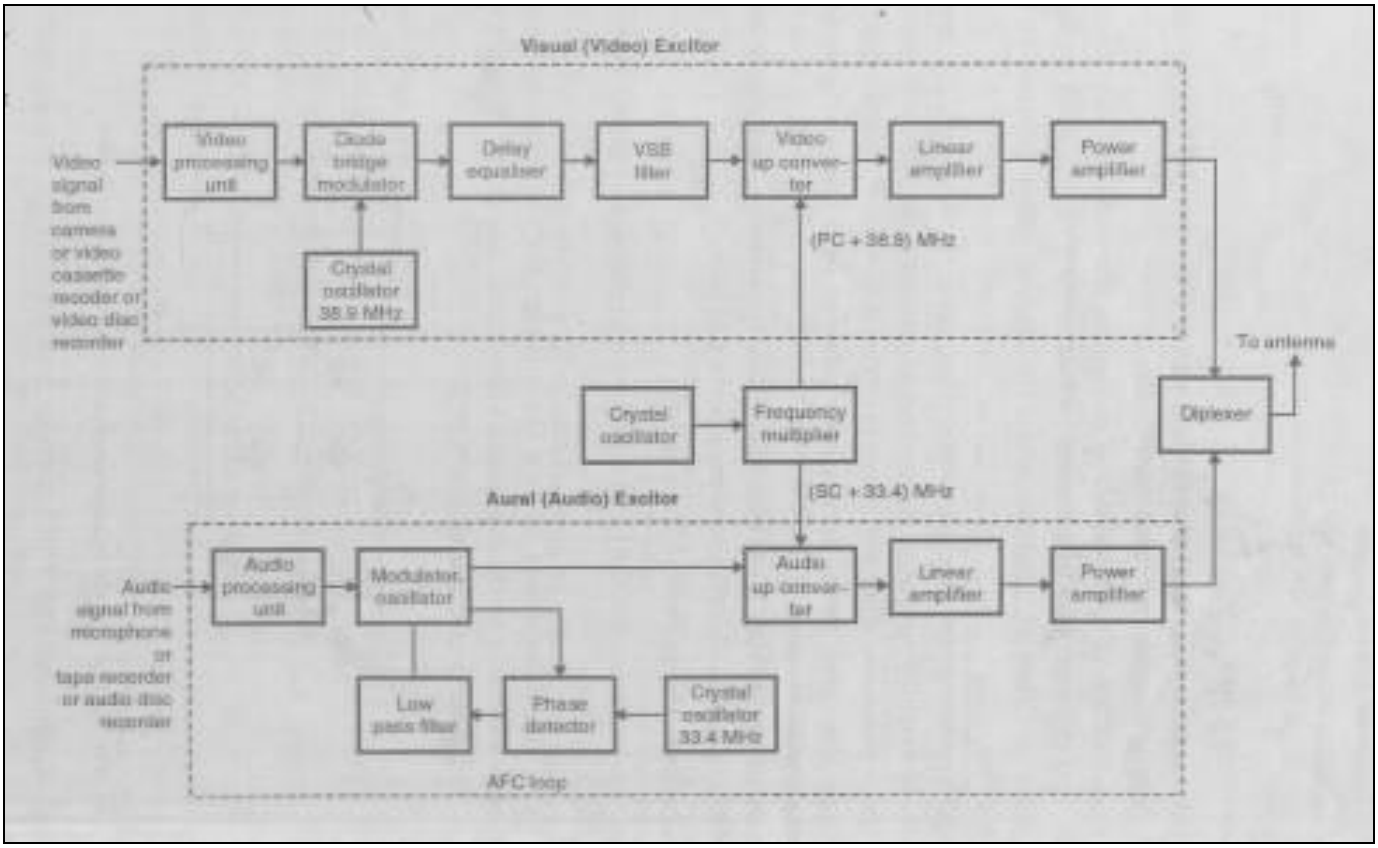


Fig: Monochrome TV transmitter

OR


Composite video signal
M
Coaxial cable to transmitter
M
TV camera
Camera amp
Equalization and signal level setting
Video amp
Distributor and switcher
Video amp
DC amp
Modulated RF amp
Power amp
Transmitting antenna
HD VD MB MS
Deflection and SP Gen
Signal level controls
From other studios
Crystal oscillator
Frequency multiplier
RF amp
VSB filter and combining network
LS
LS
Audio input
Audio processing unit
Audio amp
Distributor and switcher
Cable to transmitter
Audio amp
Pre-emphasis circuit
FM modulator
Frequency multiplier
Power amp
Audio inputs from other studios
M – monitor
LS – Loudspeaker
Crystal oscillator
AFC

OR


Visual (Video) Exciter
Video signal from camera or video cassette recoder or video disc recorder
Video processing unit
Diode bridge modulator
Delay equaliser
VSB filter
Vision up conver-ter
Linear amplifier
Power amplifier
Crystal oscillator 38.9 MHz
(PC + 38.9) MHz
To antenna
Diplexer
Crystal oscillator
Frequency multiplier
(SC + 33.4) MHz
Aural (Audio) Exciter
Audio signal from microphone or tape recorder or audio disc recorder
Audio processing unit
Modulator oscillator
Audio up conver-ter
Linear amplifier
Power amplifier
Low pass filter
Phase detector
Crystal oscillator 33.4 MHz
AFC loop

d) What is the function of V and H blanking pulses?

Ans: (Explanation: 4Marks)

- The composite video signal contains blanking pulses to make retrace line invisible.
- This is done by increasing the signal amplitude slightly more than the black level during retrace period
- Composite video signal contains horizontal and vertical blanking pulses.
- Repetition of rate of horizontal blanking pulses per frame is 15625 Hz (line frequency)
- Vertical blanking pulse frequency is 50Hz (field frequency)
- Sync pulses are having amplitude in upper 25 percent of video signal.

e) Explain how U and V signals are obtained from color difference signal.

Ans: (Diagram: 2Marks, Explanation:2 Marks)

Note: If student has explain the separation without diagram, then also marks should be given

Diagram:

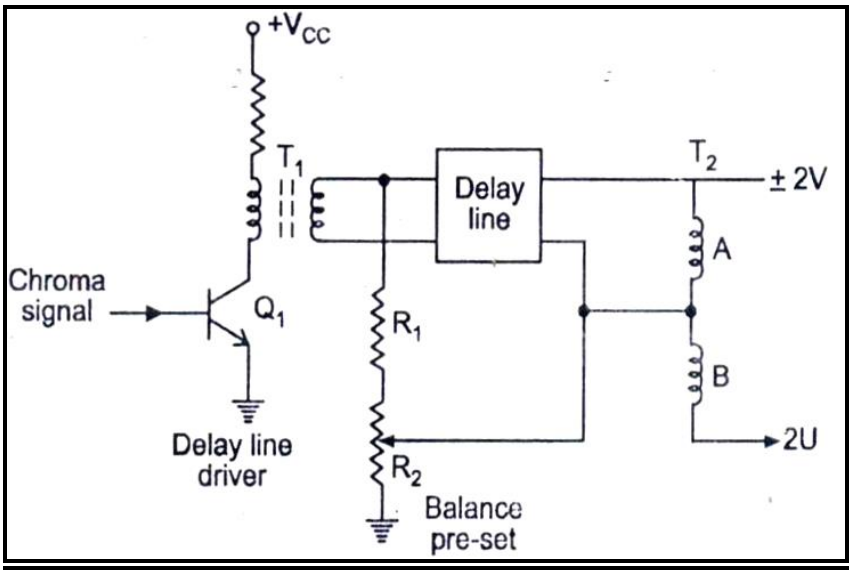


Fig. separation of U & V signals

- 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.
- 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.

OR

- 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.

Diagram:

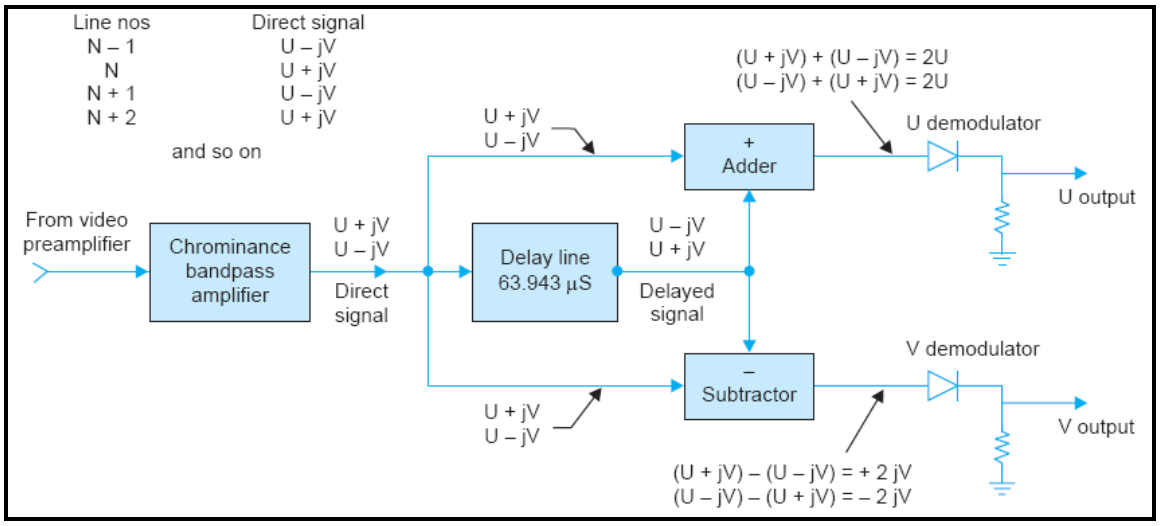


Fig. separation of U & V signals

f) Give importance of DC level in CVS.

Ans: **(Importance-1Mark each)**

- In addition to continuous amplitude variations for individual picture elements, the video signal has an average value or dc component corresponding to the average brightness of the scene.
- DC level is the level between Avg. brightness information & 0 level.
- In the absence of dc component the receiver cannot follow changes in brightness, as the ac camera signal, say for grey picture elements on a black background will then be the same as a signal for white area on a grey back-ground.
- DC components of the signal for three lines have been identified, each representing a different level of average brightness in the scene.

Q6. Attempt any FOUR of following:

a) Explain additive mixing of colours.

Ans: **(Diagram: 2 Marks, Explanation 2 Marks)**

Note: If student has explain the separation without diagram, then also marks should be given

Explanation:

- In **additive mixing** which forms the basis of colour television, light from two or more colours obtained either from independent sources or through filters can create a combined sensation of a different colour.
- Thus different colours are created by mixing pure colours and not by subtracting parts from white.
- Different colours are created by mixing pure colours hence used in TV.

Diagram:

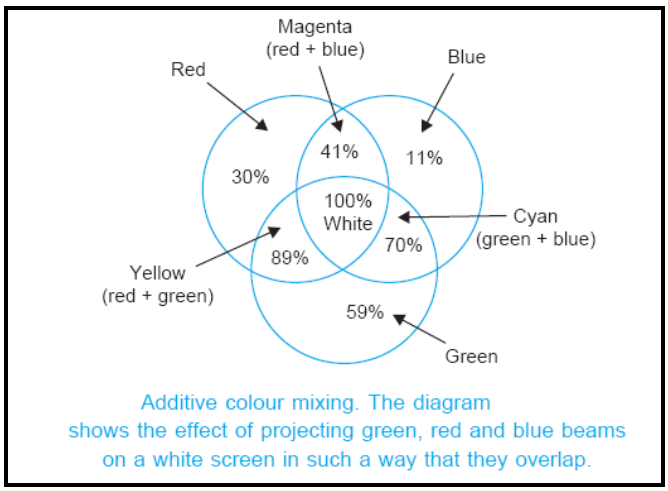


Fig: Additive colour mixing

For example,

Red + Blue = Magenta,

Red + Green = Yellow

Green + Blue = Cyan

b) Why the colour signal is suppressed before transmission of TV signal.

Ans: (Explanation:4 Marks)

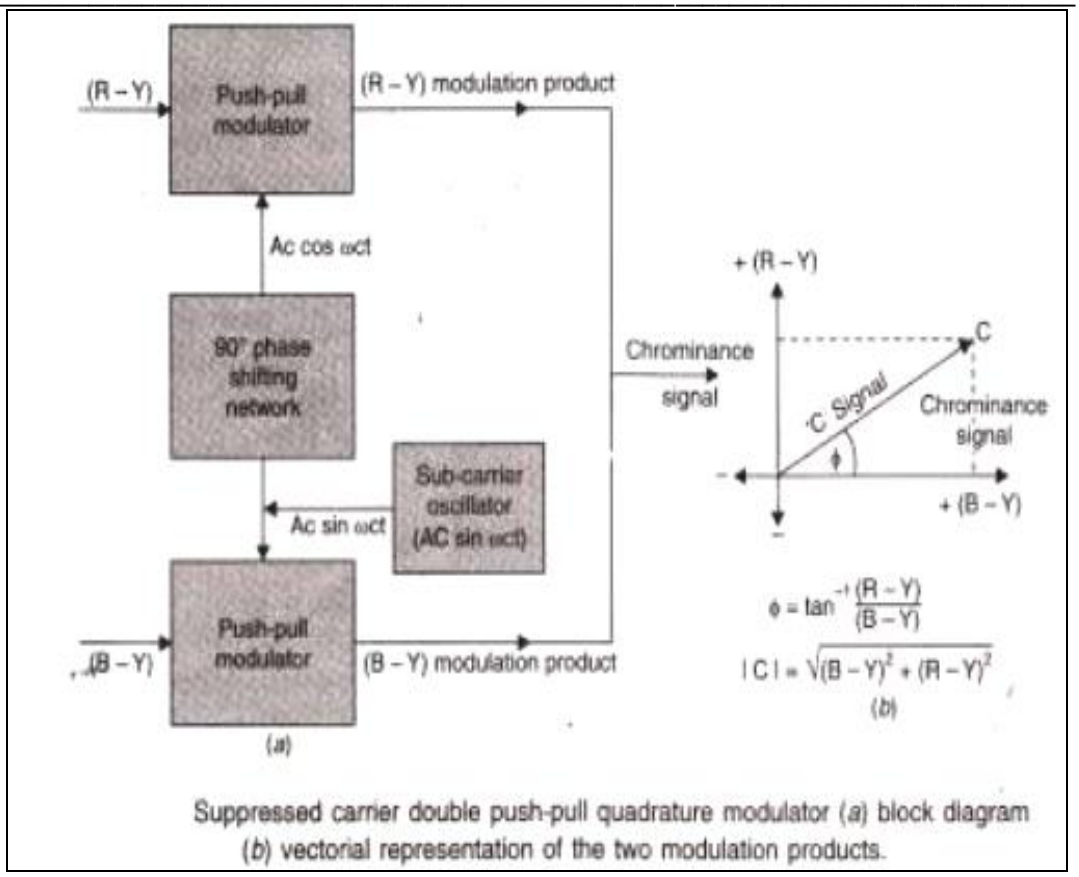
- In TV transmitter, the colour difference signals (R-Y) and (B-Y) are weighted down & then modulated by colour subcarrier frequency 4.45MHz to obtain chrominance signal.(by using QAM)
- This signal is transmitted with a suppressed subcarrier because amplitudes of the two carrier components are large compared to the sidebands products and if it is not suppressed, it will cause interference with Y signal when combined with it.
- Due to suppressed colour carrier, we do not get any interference in the monochrome receiver when they are receiving colour information and also in the colour receiver when they receive monochrome information.
- Also carrier is the large amplitude of carrier as compared to sideband frequency component. If carrier is remain as part of modulated signal it can cause serious interference and dot patterning in colour reception.
- Thus the colour carrier is suppressed before transmission and again regenerated at the receiver for demodulating for colour signal.

c) Draw block diagram of QAM for PAL and describe its working.

Ans: (Diagram:2 Marks, Explanation 2 Marks)

Note: Any other relevant diagram should be considered

Diagram:



Suppressed carrier double push-pull quadrature modulator (*a*) block diagram (*b*) vectorial representation of the two modulation products.

Fig. Block diagram of QAM for PAL

Explanation:

The problem of transmitting (B-Y) & (R-Y) video signals simultaneously with one carrier frequency can be solved by creating two carrier frequencies from same colour sub carrier. Here two modulators are used one for (B-Y) & other for (R-Y) modulator. Carrier frequency is generated by crystal oscillator & fed to (B-Y) modulator. Before feeding it to (R-Y) modulator, it is given a relative phase shift of 900. Now two modulated sub carrier are added vertically to produce resultant _C'.]C] signal represents sum of two AM signals, Mutually at right angle with each other, this technique is called as Quadrature amplitude modulation.

d) State principle of digital TV transmission with neat block diagram.

Ans: **(Diagram:2 Marks, Principle: 2 Marks)**

Note: Any other relevant diagram should be considered

Diagram:

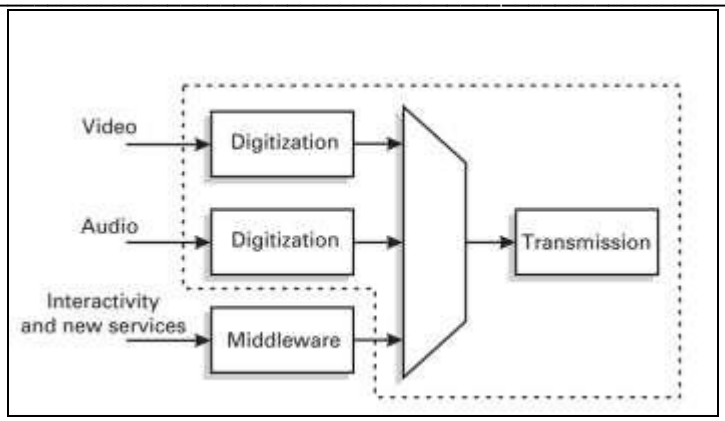


Fig. block diagram of digital TV transmission

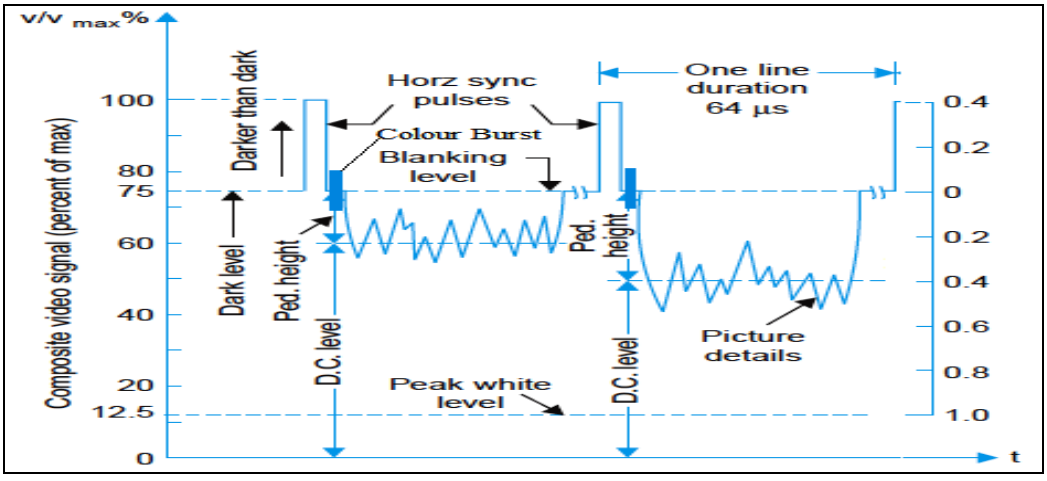
Principle:

- A digital television system is made up of a set of standards, as presented in Figure, which identifies the basic components: video and audio represent the services that are essential to the broadcasting of digital television; interactivity and the new services (e-commerce, Internet access) are added to the system by the middleware.
- These new services, introduced by digital television, originated from data transmission with video and audio.
- They may be used to offer new concepts in the broadcasting of TV programs to the users, or even to send data for applications that do not have a direct connection with television programming.
- With digital television, the viewers will be renamed users, as they participate in interaction with the TV stations and the companies that supply services.

e) Draw CCVS signal for two horizontal lines and label it well.

Ans: (Diagram:2 Marks, Labeling: 2 Marks)

Diagram:



OR Fig. CCVS

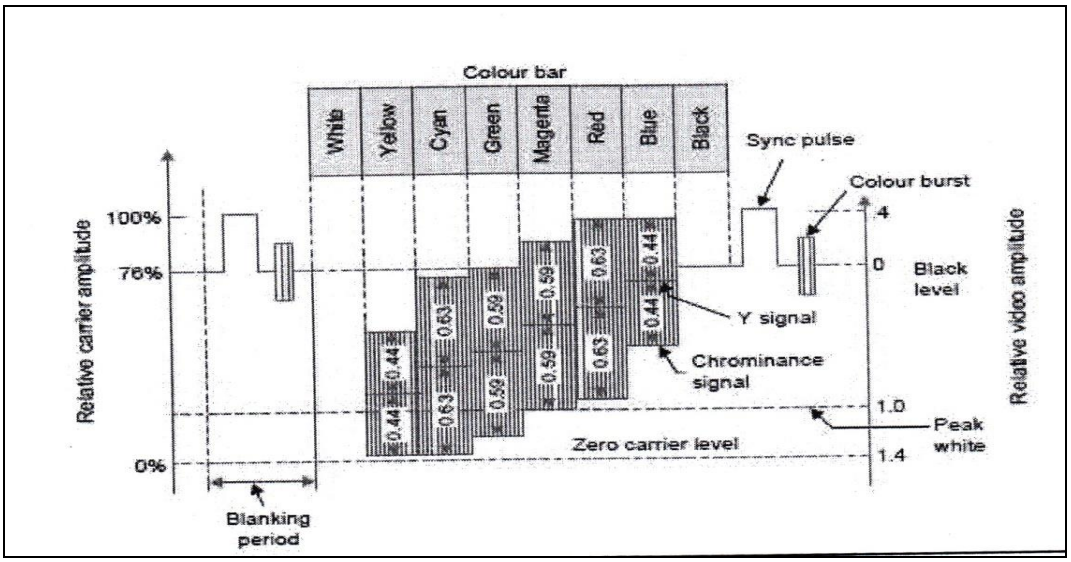


Fig. CCVS

f) What is HDTV? How are HDTV signals delivered?

Ans: (Definition: 2 Marks, Explanation: 2 Marks)

Note: (If students explain how signals are delivered without drawing diagram still marks should be given

HDTV:

Digital techniques developed in the recent past for processing television signals have lead to the developed of High Definition Tele-vision (HDTV). Improvement in both vertical and horizontal resolution of the reproduced picture by approximately 2:1 over existing standards, ii) much Improved colour rendition (reproduction), iii) higher aspect ratio of at least 5:3 and iv) stereophonic sound. Their implementation results in a picture quality as clear as obtained from 35mm cine films and sound as good as from digital audio discs.

Fig. block diagram of HDTV Encoder

OR

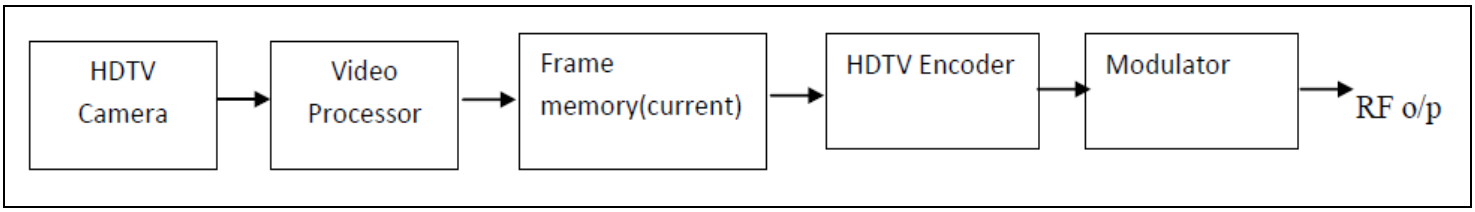


Fig. block diagram of HDTV Encoder

[Note:- Any of the above diagram can be considered]

Basic Operation:

- A frame of the input video signal (output stored of the HDTV camera) after being suitably processed is in the frame memory (current) and referred to as new frame.
- A predicted frame is generated by past frames accumulated in the frame memory (previous).
- A difference frame is obtained by subtracting the predicted frame from the new frame. since the predicted frame closely represents the new frame, there is little information left to be transmitted in the difference frame. this is the first step in video compression.
- Further compression, of the video signal is achieved by using:
    - a transform coder
    - Entropy encoding which takes advantage of redundancy in the signal obtained at the output of the transform coder.
- The coded signals along with the digital audio & control signals are multiplexed.
- To take care of error during transmission the output of the multiplexer is passed through the channel encoder.
- This is the final signal which feeds the modulator.

Note:- Video information typically remains un changes from frame to frame, except for some displacement owing to their motion. Motion related coding operations are employed to improve the performance of compression. To reduce the receiver complexity, motion vectors are evaluated at the transmitter site to frame original video signals and are sent as side information to the receiver.