MODEL ANSWER

WINTER– 18 EXAMINATION

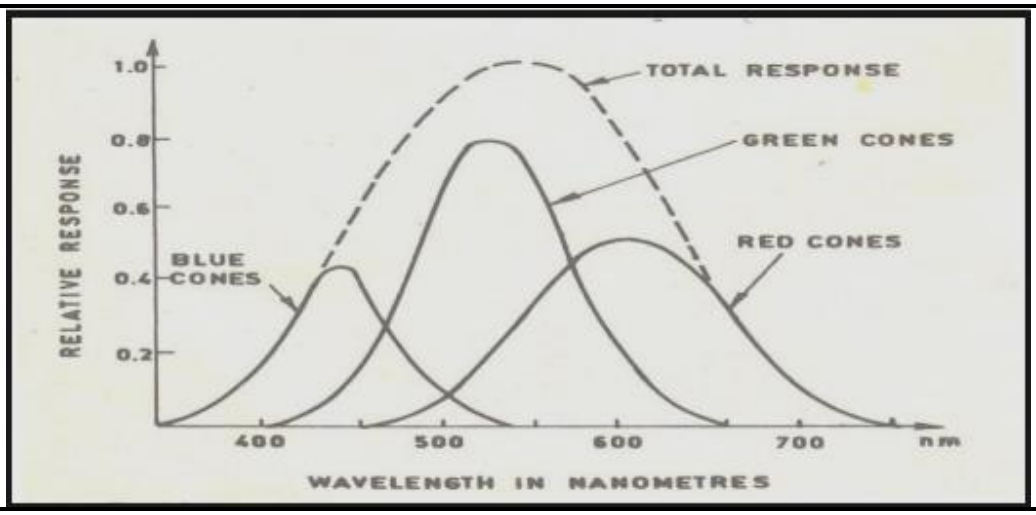
Subject Title: TV SIGNAL TRANSMISSION SYSTEM **Subject Code**: 17441

Important Instructions to examiners:

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

Q. No.	Sub Q.N.	Answer	Marking Scheme
Q.1	**a)**	**Attempt any SIX of the following :**	**12-Total Marks**
	i)	**Define –** **(1) Kell factor** **(2) Image continuity.**	**2M**
	Ans:	**Kell factor** The Kell factor is used in estimating the actual resolution achieved in TV pictures i.e. to estimate actual no. of horizontal and vertical lines are resolved by human eye. **Image continuity.** The picture information is transmitted line by line, but we get impression of continuity due to a phenomenon called "persistence of vision" of the human eye is called image continuity	**1M** **1M**
	ii)	**State the concept of gross structure of TV system.**	**2M**
	Ans:	• It is defined as Geometric form and aspect ratio of the picture. • The frame adopted in all television systems is rectangular with width/height ratio, i.e., aspect ratio = 4/3.	**2M**

	iii)	**What is field blanking interval. State its value**	**2M**
	Ans:	The Interval which is required to blank the corresponding retrace intervals. The Field blanking intervals are used for settling beam at top of the screen again to start the next field. Vertical Blanking interval: 1.280ms.	**1M** **1M**
	iv)	**Band II is not use for TV signal Transmission. Justify.**	**2M**
	Ans:	Band II (88 -108 MHz) is used for FM broadcasting that is for sound signal transmission	**2M**
	v)	**Write Grassmen's law of additive colour mixing.**	**2M**
	Ans:	The algebraic sum of Red Blue and Green colour lights falling on white screen keeping brightness constant is called Grass-Man‟s law. It is represented by below equation for 100% white light. **Y= 0.59(G) + 0.30 (R) + 0.11(B)** Where G, R and B are the intensities of green, red and blue lights.	**2M**
	vi)	**List the advantages of PAL system.**	**2M**
	Ans:	**Note: Any 2 advantages** • PAL TV systems, hue errors are automatically removed with the utilization of phase alternation of colour 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 colour fidelity is achieved. • With the help of a delay line and two adders, the PAL decoder adds colour signals of successive lines while cancelling out phase errors. • Excellent colour stability	**2M**
	vii)	**Draw a graph showing spectral response of human eye.**	**2M**
	Ans:	**Note: Any other relevent diagram can be considered.**	**2M**

		
viii)	**Why FM signal is prefferred for sound and AM for Picture transmission.**	**2M**
Ans:	**Note: Any other relevant Reason can be considered.** **Suitability of FM for sound signal transmission:** • FM is capable of providing almost noise free and high fidelity output. • S/N ratio is high in FM system. Random changes in amplitude are greatly suppressed in FM. • Due to capture effect in FM system, weak interfering stations are fully suppressed. **Suitability of AM for picture signal transmission:** • Detection of baseband signal from the modulated wave is very easy using a single diode rectifier and a simple LPF circuit which is low price makes it popular. • AM detector does not detect changes in phases but detects the changes in amplitude. Hence output of the detector is free of phase noise. As eyes are sensitive to phase noise, its absence in the output makes AM suitable for picture. FM can detect changes in phase and hence it is unsuitable for video	**2M (any 1 point each)**
b)	**Attempt any <u>TWO</u> of the following :**	**8**
(i)	**Define –** **(1) Brightness** **(2) Contrast** **(3) Viewing distance** **(4) Luminance**	**4M**
Ans:	**Brightness:-** Brightness is the overall or average intensity of illumination and it determines background light level in the reproduced picture. **Contrast: -** This is the difference in light intensity between black and white parts of the	**1M Each definition**

picture over the average brightness level.

Viewing distance:-
This viewing distance from screen of TV receiver should not be large or too small. The distance varies from person to person and lies between 3 to 8 times the picture heights. The preferable distance is close to 5 times the picture height.

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

(ii) **What is colour burst? Why it is needed? How it is accomodated in picture signal.** **4M**

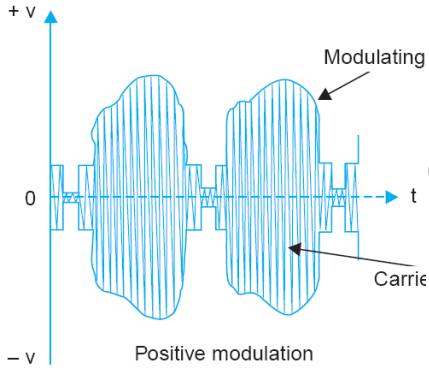
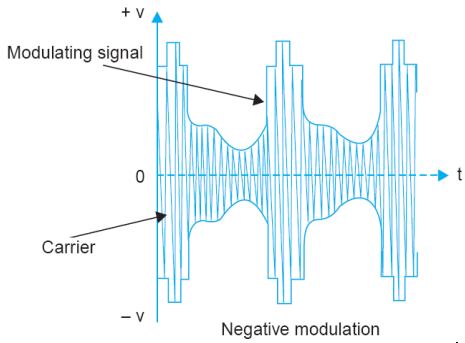
Ans: **Note: Any other relevant answer can be considered.**

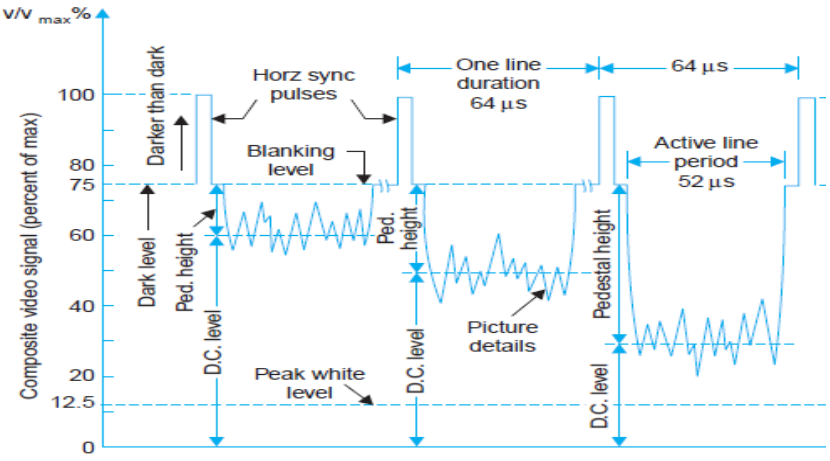
- **A short sample of the subcarrier oscillator, (8 to 11 cycles) called the "colour burst"** **1M**
- The transmitted signal does not contain the subcarrier frequency but it is necessary to generate it in the receiver with correct frequency and phase relationship for proper detection of the colour sidebands. **2M**
- To ensure this, is sent to the receiver along with sync signals. Subcarrier frequency is 4.43MHz.
- The Colour burst signals (8 to 11 cycles) are accommodated in the back porch of the horizontal sync pulse. **1M**

(iii) **Compare positive and negative amplitude modulated signals. (4 points)** **4M**

Ans: **1 Marks each (any 4 points)**

	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.	1.	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.	2.	White level of video signal correspondence to 12.5% of the total amplitude.

		3.	Noise pulses do not affect synchronization but cause white spot in the picture	3.	Noise pulses are seen as less annoying black spot.	
		4.	More power is required with less efficiency	4.	If peak power available from transmitter is considered them less power is required for more efficiency.	
		5.	Black level of video signal correspondence to 25% of total magnitude.	5.	Blanking level starts at 75%	
		6.		6.		
Q 2		**Attempt any FOUR of the following :**				**16-Total Marks**
	a)	**What is Kell factor? How does it affect vertical resolution of T.V. signal?**				**4M**
	Ans:	• Kell factor is the measure of effective resolution of an interlaced scanning system. The effective resolution is always less than the number of scan lines because of the random nature of subject details. • The value of kell factor lies in the range between 0.64 to 0.85 • The Kell factor is used in estimating the actual resolution achieved in TV pictures i.e. to estimate actual no. of horizontal and vertical lines are resolved by human eye. • Kell factor can be used to determine the horizontal resolution that is required to match the vertical resolution attained by a given number of scan lines. • Therefore the kell factor plays important role while calculating Vertical resolution.				**1M for definition** **3M Reasoning**
	b)	**Explain pedestal height with neat diagram.**				**4M**
	Ans:	Note: Students have to show only **pedestal Height in the diagram**				**2M Diagram**



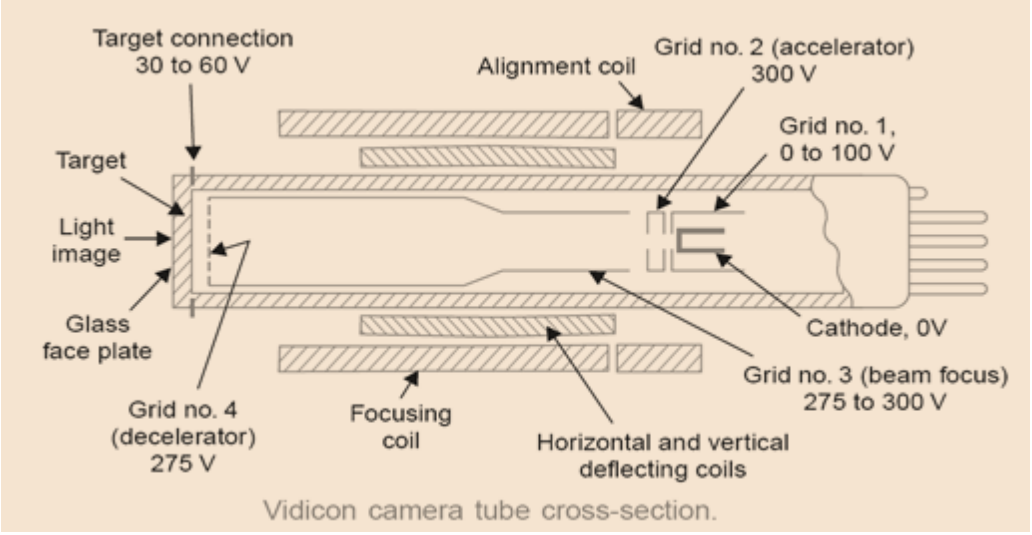
2M Explanation

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.
- 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) Draw neat labeled schemetic diagram of Videocon camera tube and state it's working. — **4M**

Ans:

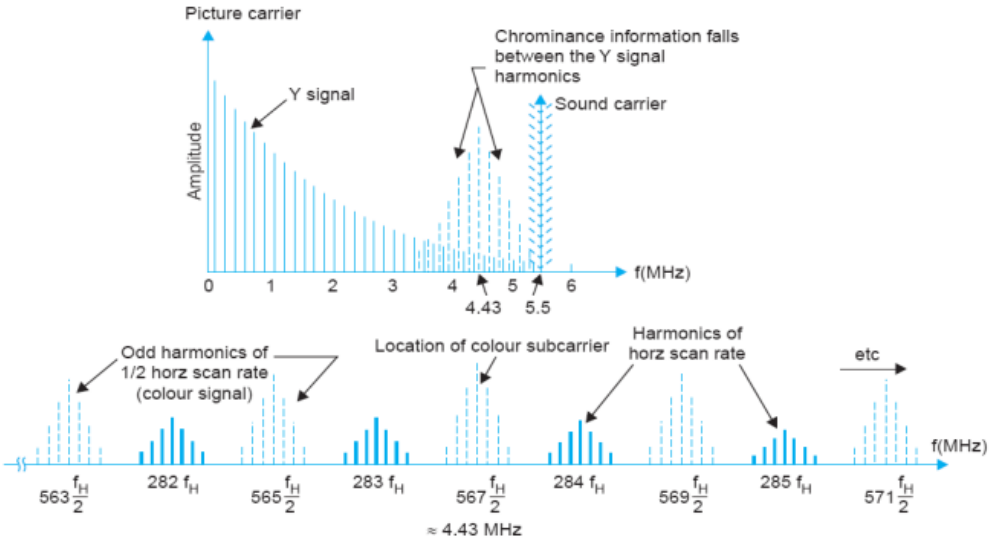


Vidicon camera tube cross-section.

2M Diagram
2M Explanation

Working:

- As shown in figure, 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.
- This conductive coating is known as signal electrode or plate. Image side of

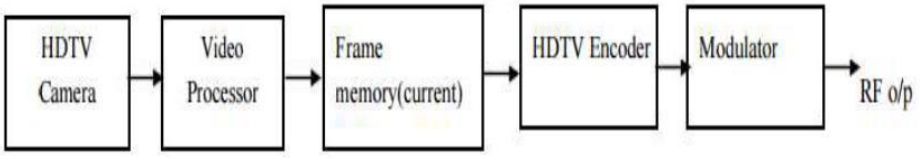
		the photo layer, which is in contact with the signal electrode, is connected to DC supply through the load resistance RL. • The beam that emerges from the electron gun is focused on surface of the photoconductive layer by combined action of uniform magnetic field of an external coil and electrostatic 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. • Deflection of the beam, for scanning the target, is obtained by vertical and horizontal deflecting coils, placed around the tube.	
	d)	**With the help of appropriate sketch, explain why and how interleaving is done in colour transmission.**	**4M**
	Ans:	 **Explanation:** • 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. • The lower amplitude excursions that occur on either side of the peaks are spaced at 50 Hz intervals and represent harmonics of the vertical scanning rate. The vertical sidebands contain less energy than the horizontal because of the lower rate of vertical scanning. • Note that the energy content progressively decreases with increase in the order of harmonics and is very small beyond 3.5 MHz from the picture carrier.	**2M Diagram** **2M Explanation**
	e)	**Explain the different factors which influence the choice of colour subcarrier frequency in PAL TV system.**	**4M**
	Ans:	**Note: Any other relevant Point can be considered.**	**4M (1 EACH POINT)**

Factors influencing colour subcarrier frequency:

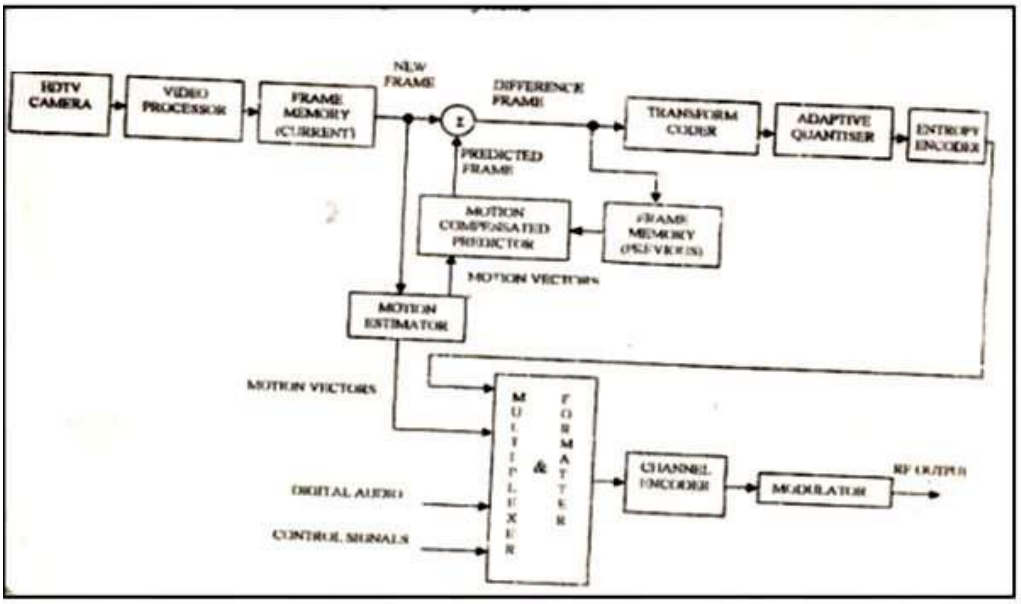
- The picture carrier and the colour subcarrier should be located quite apart from each other to avoid any beat interference between the two signals due to some overlaps and imperfect frequency interleaving.
- Some dot pattering may appear on the colour subcarrier along with the Y signal. This effect can again be reduced by choosing a higher subcarrier frequency.
- Fsc cannot 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 fsc 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.
  4. A higher values of fsc would place the complex chroma signal in this region causing its distortion.
  5. Any phase shift of the chroma signal affects hues and hence too high a value of fsc is not desirable.

f) Draw block diagram and explain working of HDTV transmitter. **4M**

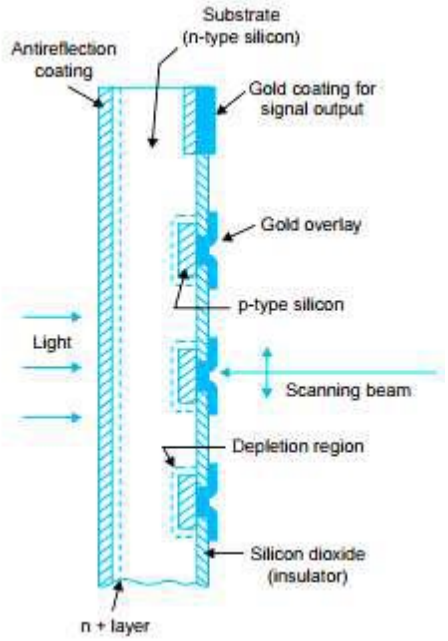
Ans: **02M**

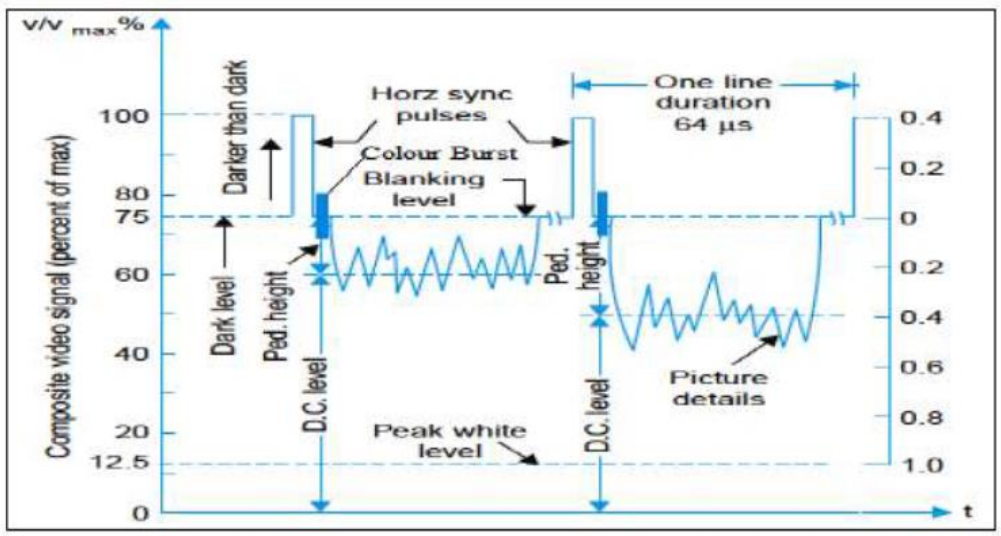
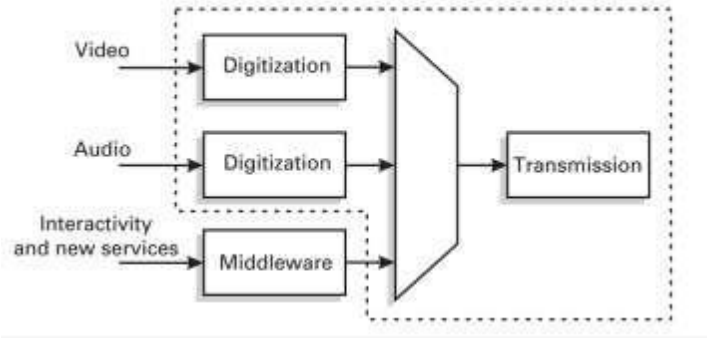


OR

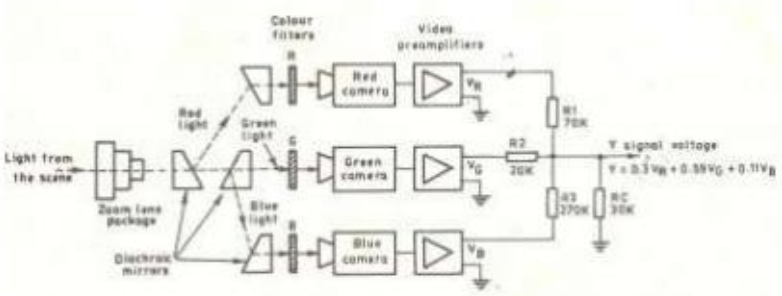
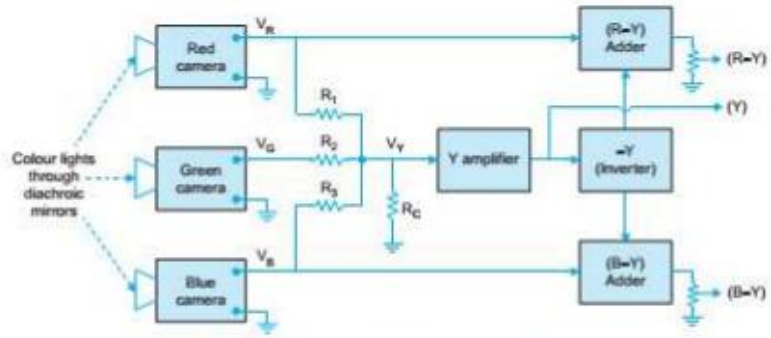


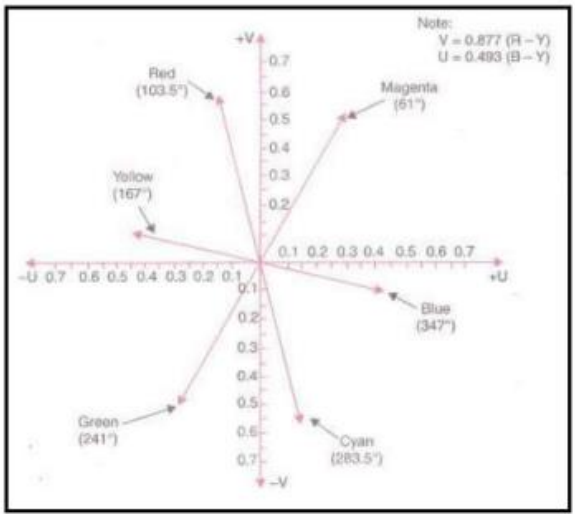
		Working:- • A frame of the input video signal (output stored of the HDTV camera) after being suitably processed is in the frame memory (current) and referred to as new frame. • A predicted frame is generated by past frames accumulated in the frame memory (previous). • A difference frame is obtained by 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 o 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.	**02M**
Q. 3		**Attempt any <u>FOUR</u> of the following :**	**16-Total Marks**
	a)	**What is interlaced scanning ? How flickers are eliminated using it?**	**4M**
	Ans:	• In television pictures an effective rate of 50 vertical scans per second is utilized to reduce the flicker. This is accomplished by increasing the downward rate of travel of the scanning electron beam, so that every alternate line gets scanned instead of successive line. • Then when the beam reaches the bottom of the picture frame it quickly returns to the top to scan those lines that were missed in the previous scanning. • Thus, the total numbers of lines are divided into two groups called "fields". Each field is scanned alternately. This method of scanning is called "interlaced scanning." **Eliminate flicker: (any other reasons can be considered)** • 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.	**2M** **2M**
	b)	**Give bandwidth of colour signal? Why is is lesser than luminance signal.**	**4M**
	Ans:	**Bandwidth of colour signal is 1.3MHz to 1.5 MHz** • The colour video signals do not require a large bandwidth like Y signal which is transmitted with full frequency bandwidth of 5MHz for maximum horizontal details in	**1M** **3M**

		monochrome. • If the object is very small then eye cannot recognize the colour but sees only the brightness. • The luminance signal Y carries all the fine details of the picture. • For colours formed by two primaries, the video spectrum lies between 0.5MHz and 1.3MHz. • For colours formed by all the three primaries, video frequencies are below 0.5MHz; therefore in colour transmission it is not necessary to send colour information beyond 1.5MHz. **c) Differentiate**	
c)		**Draw neat block diagram of silicon diode array camera tube.**	**4M**
Ans:		**Note: Any other relevant diagram can be considered.**  	**4M**
d)		**List advantages and disadvantages of digital TV transmission system. (2 each)**	**4M**
Ans:		**Advantages: (Any two)** • Reduction of 50Hz flicker. • High resolution pictures. • Slow motion action. • Easy adoption to additional displays. • Reduced operational instability. **Disadvantages: (Any two)** • 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	**02M** **02M**

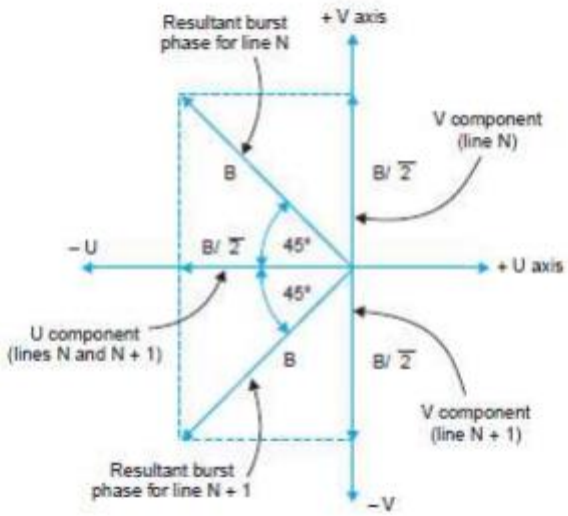
	e)	**Draw a neat labelled Colour Compare Video Signal (CCVS)**	**4M**
			**4M**
	f)	**State the principal of digital TV transmission with labelled block diagram.**	**4M**
	Ans:	 **Working:** • A digital television system is made up of a set of standards, as presented in Figure, which identifies the basic 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.	**2M** **2M**
Q. 4	**A)**	**Attempt any FOUR of the following :**	**16-Total Marks**
	a)	**Whar are the application of progressive scanning (any four) and also list any two advantages of interlaced scanning.**	**4M**
	Ans:	**Application (any four):- ½ M**	**Application**

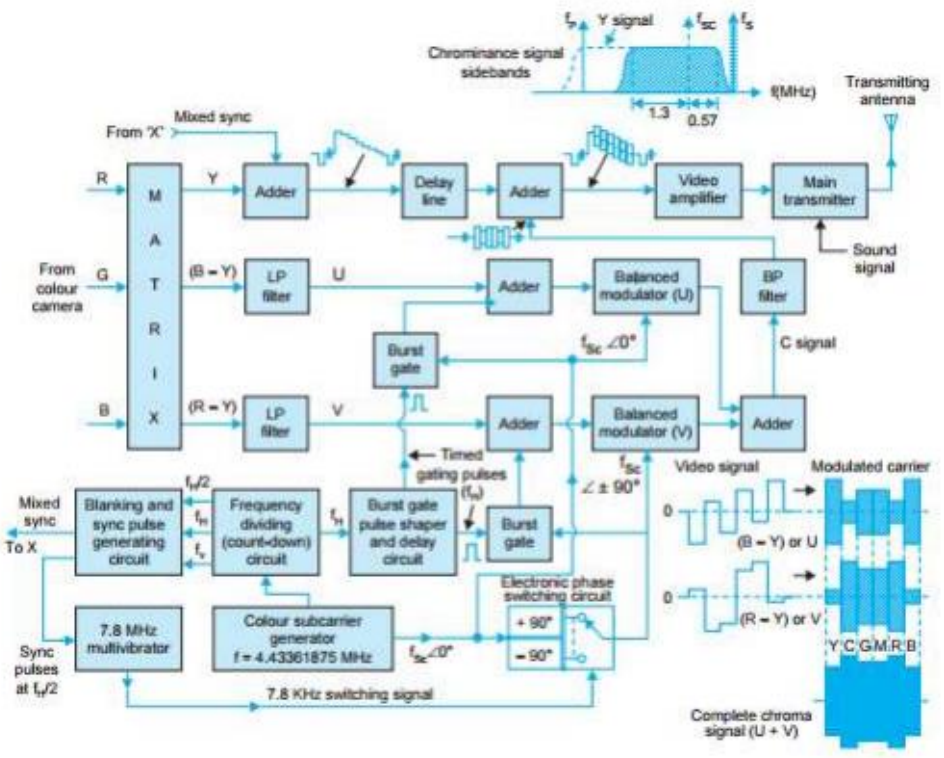
		1. Each Progressive scanning is used for displaying, storing, or transmitting moving images in which all the lines of each frame are drawn in sequence. 2. It is used for cathode ray tube (CRT). 3. It is used for CRT computer monitors. 4. It is used for LCD computer monitors. **5.** It is used for HDTV‟s as the display resolution It is also used in other CRT-type displays such as SDTVs. **Advantages of interlaced scanning:** 1. It reduces the video BW because the total number of lines scanned/sec. remains unchanged. **2.** It also avoids the problem of flicker since scanning rate is doubled i.e. 50 frames/sec.	**(any four):- ½ M each,** **Advantages 2M**
	b)	**State the any eight characteristics of CCIR-B system for monochrome TV.**	**4M**
	Ans:	**Characteristics of CCIR-B system:-** 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 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% Blanking/pedestal level 75%• 19. Black level 72-75% 20. White level 10-12.5% 21. Width of video signal =5MHz 22. Chroma signal bandwidth -1.3MHz to +1.57MHz 23. Video IF =38.9MHz 24. Audio IF= 33.4MHz 25. Inter carrier frequency= 5.5MHz 26. Audio modulation Frequency Modulation(FM) 27. Video modulation Amplitude Modulation (AM) 28. Total channel width in VHF= 7MHz	**Any 8) ½ M each**

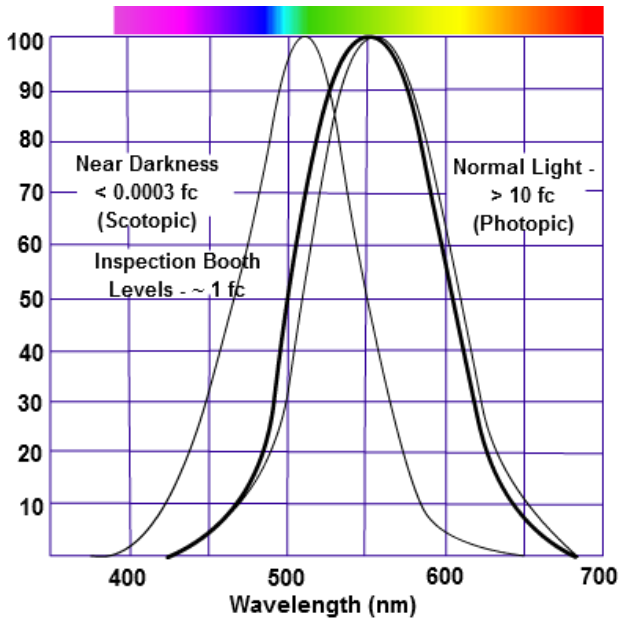
		29. Total channel width in UHF= 8MHz	
	c)	**Draw and describe the working of color camera giving output (R-Y), (B-Y) and Y signal.**	**4M**
	Ans:	**Explanation:-** Figure shows a simple block schematic of color TV camera. It essentially consists of three camera tubes in Which each tube receives selectively filtered primary colors. Each camera tube develops a signal voltage proportional to the respective color intensity (luminance) received by it. Light from the scene is processed by the objective lens system. The image formed by the lens is split into three images by means of glass prisms. These prisms are designed as diachronic mirrors. A diachronic mirror passes one wavelength and rejects other wavelength (colours of light).Thus red, green and blue colour images are formed. The rays from each of the splitters also pass through colour filters called trimming filters. These filters provide highly precise primary colour images which are converted into video signals by image-orthicon or vidicon camera tubes. Thus the three colour signals are generated. These are called Red(R), Green (G) and Blue (B) signals. The voltage Vy as obtained from the resistance matrix is low because Rc is chosen to be small to avoid crosstalk. Hence it is simplified before it leaves the camera sub-chassis. Also, the amplified Y signal is inverted to obtain –Y as the output. This is passed on to the two adder circuits First Adder circuit adds the red camera output –Y to obtain (R-Y) signal. Similarly the second adder combines blue camera output to –Y and delivers (B-Y) as its output. This is illustrated in below fig. The difference signals thus obtained bear information both about the hue and saturation of different colours.  **OR**  Fig. 25.9. Production of luminance and colour-difference signals. Note that Y = 0.3R + 0.59G + 0.11B (R – Y) = 0.7R – 0.59G – 0.11B and (B – Y) = 0.89B – 0.59G – 0.3R.	**Explanation :- 02M** **Diagram:- 02M**

	d)	**Draw phasor diagram for weighted primary colors and calculate their phase and magnitude.**	**4M**
	Ans:	The amplitude and phase angle of primary colure can be found out from weighted value of (B-Y) and (R-Y). $(B-Y)$ weighted = 0.493 $(B-Y)$ unweighted $(R-Y)$ weighted = 0.877 $(R-Y)$ unweighted **Phasor Diagram:-** 	**(Calculation 02M, Phasor Diagram 02M)**
	e)	**Describe concept pf PAL-V switching and its purpose with the help of phasor diagram.**	**4M**
	Ans:	**Diagram:**	**Diagram:- 02M,**

COLOUR	Y	U	V	'C'	ϕ
White	1	0	0	0	0°
Yellow	0.89	– 0.4385	+ 0.0965	0.44	167°
Cyan	0.70	+ 0.148	– 0.614	0.63	283°
Green	0.59	–0.29	– 0.5174	0.59	241°
Magenta	0.41	+ 0.29	+ 0.5174	0.59	61°
Red	0.31	– 0.148	+ 0.614	0.63	103°
Blue	0.11	+ 0.4385	– 0.0965	0.44	347°
Black	0	0	0	0	0°

		 **Explanation:-** 1. If the PAL signal were applied to an NTSC type decoder, the (B – Y) output would be U as required but the (R – Y) output would alternate as + V and – V from line to line. 2. Therefore, the V demodulator must be switched at half the horizontal (line) frequency rate to give „+ V "only on all successive lines. Clearly the PAL receiver must be told how to achieve the correct switching mode. 3. A colour burst (10 cycles at 4.43 MHz) is sent out at the start of each line. 4. Its function is to synchronize the receiver colour oscillator for reinsertion of the correct carrier into the U and V demodulators. 5. Note that the burst phase actually swings 45° 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. 6. Thus the necessary switching mode information is always available. 7. Since the colour burst shifts on alternate lines by ± 45° about the zero reference phase it is often called the swinging burst.	**Explanation :- 02M**
	f)	**Draw the block diagram of PAL Encoder with o/p waveforms.**	**4M**
	Ans:	**Diagram:-** **NOTE:- Any other relevant diagram can be considered**	**(Diagram 03M, Waveform 01M)**

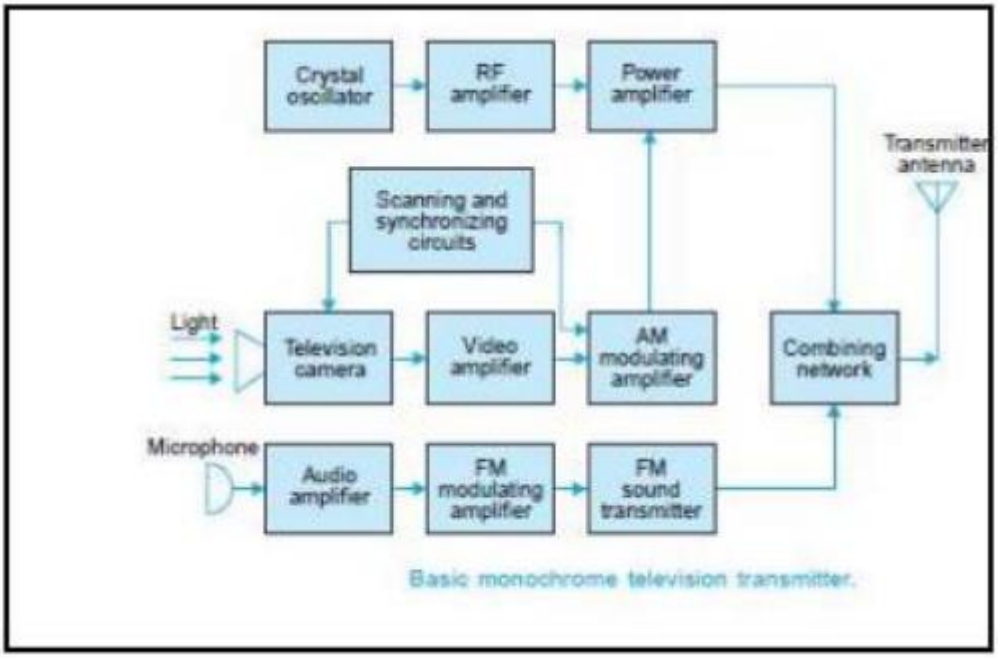


Q.5		**Attempt any FOUR of the following :**	**Total Marks 12**
	a)	**With the help of labeled sketch for internal construction, explain how human eye perceives brightness and hue and colour.**	**4M**
	Ans:		

The three curves in the figure above shows the normalized response of an average human eye to various amounts of ambient light. The shift in sensitivity occurs because two types of photo receptors called cones and rods are responsible for the eye's response to light.

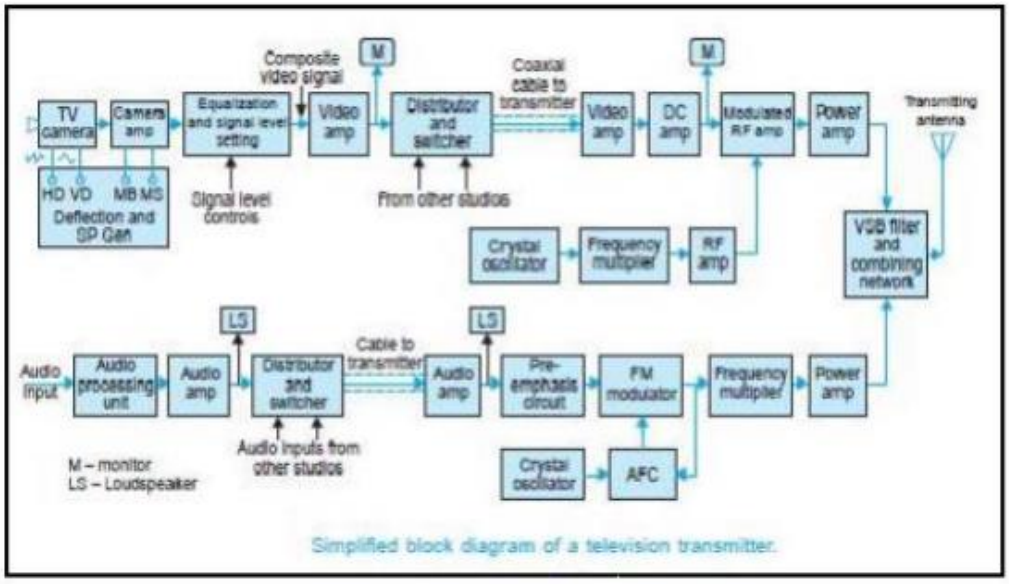
		The curve on the right shows the eye's response under normal lighting conditions and this is called the isotopic response. The cones respond to light under these conditions. Cones are composed of three different photo pigments that enable color perception. This curve peaks at 555 nanometer, which means that under normal lighting conditions, the eye is most sensitive to a yellowish-green color. When the light levels drop to near total darkness, the response of the eye changes significantly as shown by the isotopic response curve on the left. At this level of light, the rods are most active and the human eye is more sensitive to the light present, and less sensitive to the range of color. Rods are highly sensitive to light but are comprised of a single photo pigment, which accounts for the loss in ability to discriminate color. At this very low light level, sensitivity to blue, violet, and ultraviolet is increased, but sensitivity to yellow and red is reduced. The heavier curve in the middle represents the eye's response at the ambient light level found in a typical inspection booth. This curve peaks at 550 nanometre, which means the eye is most sensitive to yellowish-green color at this light level. Fluorescent penetrant inspection materials are designed to fluoresce at around 550 nanometre to produce optimal sensitivity under dim lighting conditions.	
	b)	**Give importance of DC levels in CVS.**	**4M**
	Ans:	**Importance of DC Level:-** 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.	
	c)	**Draw basic block diagram and write working of monochrome TV transmitter.**	**4M**

Ans:



Basic monochrome television transmitter.

OR



Simplified block diagram of a television transmitter.

Working :

TV camera: The heart of which is a camera tube, is used to convert the optical information into a corresponding electrical signal, the amplitude of which varies in accordance with the variations of brightness.

Microphone: It converts the sound associated with the picture being televised into proportionate electrical signal, which is normally a voltage.

Sync and scanning circuits: It is use to extract the electrical current from the photosensitive target of the camera tube with the help of a scanning beam which is produced by saw tooth current through horizontal and vertical deflection coils. **Video amplifiers:** Videos signals along with blanking and sync pulses called composites video signals are amplified by using video amplifier.

Audio Amplifier: It amplifies the audio signals.

Combining Bridge or Combining Network: Video modulated and audio modulated signals are passing through this network to go a common

(Block Diagram:2 M,

		transmitting antenna. This bridge prevents audio modulated signals from going to video section and vice versa to avoid overloading. **Transmitting antenna:** Video modulated and audio modulated signals are fade to common transmitting antenna which radiates this signals into the space on the form of EM.	**Explanation 2M)**
	d)	**Explain the purpose of equalizing pulses transmitted during vertical synchronous pulses.**	**4M**
	Ans:	**Explanation:-** There is a ½ line difference just prior to the start of serrated vertical pulse. This ½ line difference does not affect the horizontal deflection synchronization but it does affect the vertical synchronization and the interlaced scanning. So to avoid this 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 2.3μs 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 sync pulses, roughly half of 4.7μs or (2.3μs) each as mentioned before. 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. We have seen that the vertical slots of 4.7μs duration that are inserted in the vertical sync period to achieve horizontal synchronization are called serrated pulses. The pre-equalizing, post equalizing and serrated pulses are necessary to correct interlaced scanning. The field sync pulses give triggering pulse to the vertical oscillator (field oscillator) Horizontal oscillator receives triggering pulses even during the vertical blanking due to the presence of serrated pulses. Vertical sync pulses are available at the end of the line of second field and at the middle of the line at the end of first field. The equalizing pulses are provided to avoid timing error at vertical oscillator. The shape of the vertical trigger pulse is maintained at both even and odd fields. Diagram:	**Explanation 02M,** **Diagram 2M**

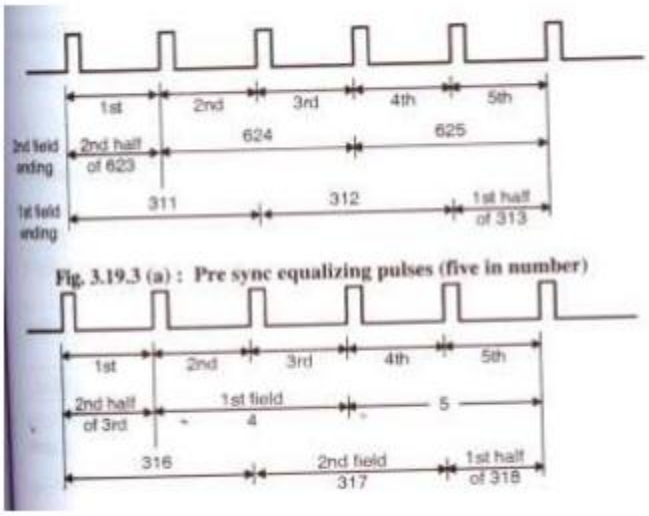
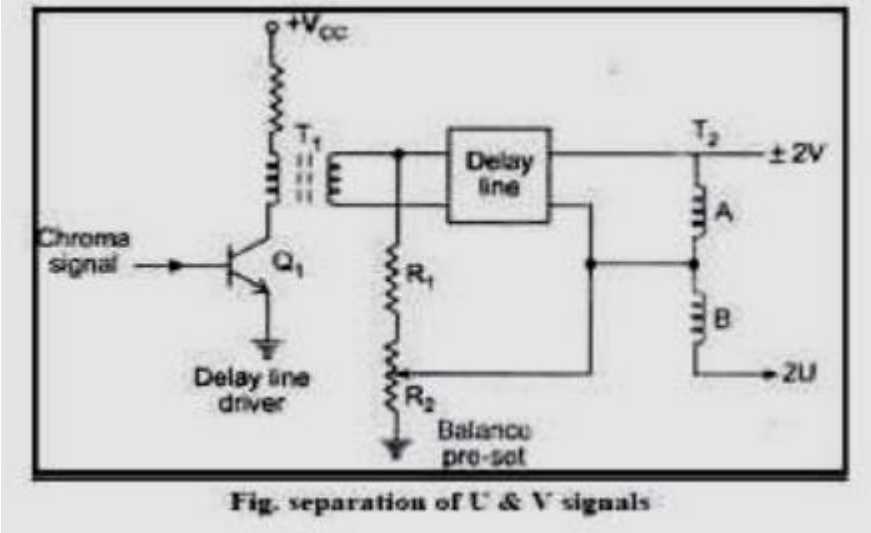
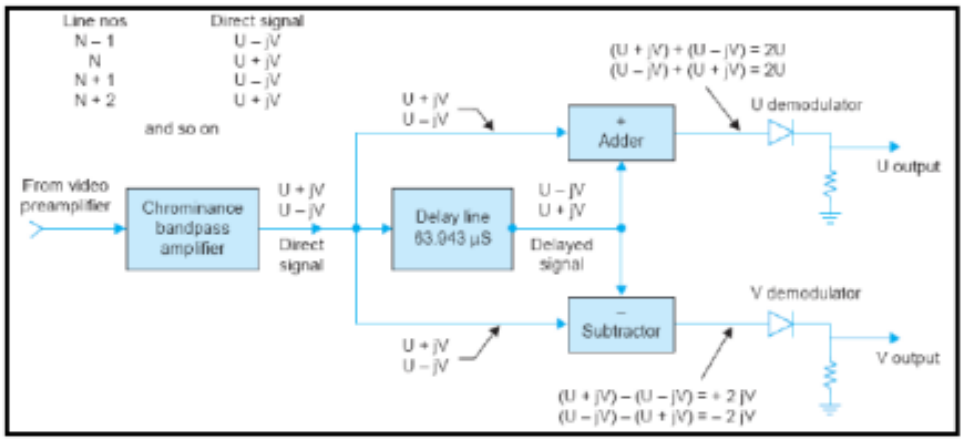


Fig. 3.19.3 (a) : Pre sync equalizing pulses (five in number)

e)		**Explain how U and V signals are obtained from color difference signal.**	**4M**
Ans:		 Fig. separation of U & V signals **OR**  Fig. separation of U & V signals	**Diagram 2M**

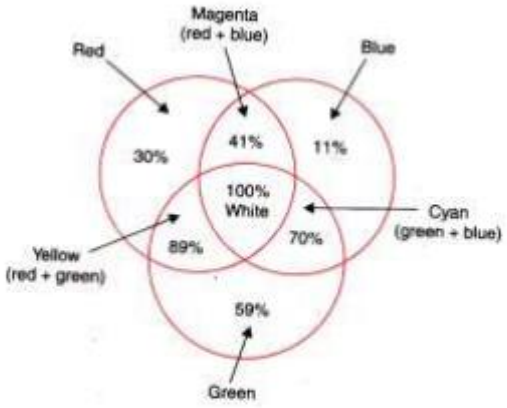
Explanation / Working: -

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.	**Explanation 2M**
	f)	**Write the frequency range of T.V. channel allocation for Band I and III.**	**4M**
	Ans:	**TV channel allocation for Band I and Band –III:**	**2M each**

Band	*Channel 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

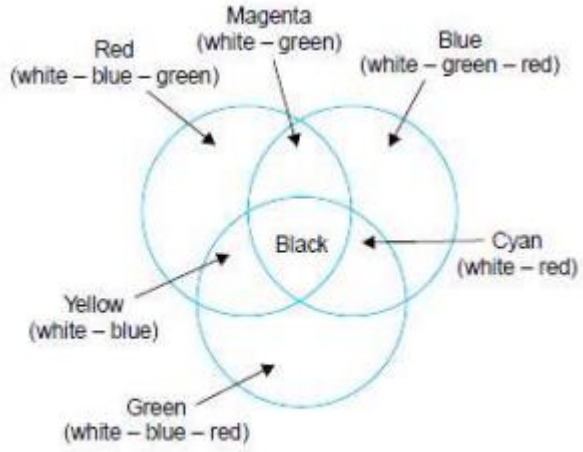
Q.6		**Attempt any FOUR of the following:**	**Total Marks 16**
	a)	**Describe additive and subtractive mixing of colours with neat diagram.**	**4M**
	Ans:	**Note: If student has explain the separation without diagram, then also marks should be given** **Additive mixing:** In this type of mixing light from two or more colours obtained either from independent sources or through filters can create a combines sensation of a different colour. Secondary colours result when two primary colours of equal magnitude are additively mixed. By pair wise additive mixing of colours the following complementary colours are produced. Red (30%) + Green (59%) =Yellow (89%) Red (30%) + Blue (11%) = Magenta (41%) (Purplish blue) Blue (11%) + Green (59%) = Cyan (70%) (Greenish blue) Red (30%) + Green (59%) + Blue (11%) = White (100%) (Luminance) Additive mixing occurs when we see the light emitted by the sources	**02M**



Venn diagram of Additive mixing

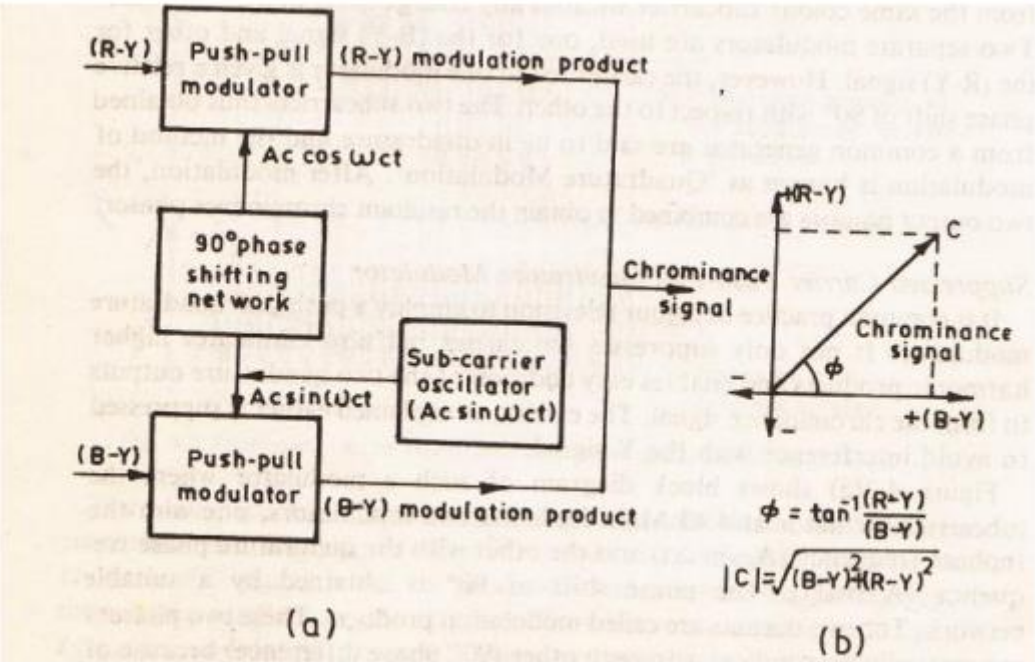
Subtractive mixing: Secondary Colours (cyan, magenta, and yellow) of additive mixing are called primary colours of subtractive mixing. • Result of subtractive mixing is shown in Venn diagram for e.g. [white-red = cyan] • The three basic primary colours R, G, B can be written with minus sign in front of them. For e.g. -Green, - blue, - red (Minus sign indicates the colour absorbed from the incident light.) -green = white – green {magenta} -Blue = white – blue {yellow} - Red = white – red {cyan}

02M



Venn diagram of subtractive mixing

b)	**Colour signal is suppressed before transmission of TV signal, give reasons.**	**4M**
Ans:	**Explanation:-** 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	**Explanation :- 04M**

		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.**	**4M**
	Ans:	**Diagram:-**  **Explanation:** In colour television two colour- difference signals need two carrier frequencies for their transmission but only one carrier (colour subcarrier) is available for this purpose. This problem is solved by creating two carrier frequencies from the same colour subcarrier without any change in its numerical value. Two separate modulators are used, one for the (B-Y) signal and other for the (R-Y) signal. However, the carrier fed to one modulator is given a relative phase shift of 900 with respect to the other. The two subcarriers thus obtained from a common generator are said to be in quadrature and the method of modulation is known as „Quadrature Modulation". After modulation, the two output phasors are combined to obtain the resultant chrominance phasor.	**2M** **2M**

d) Compare standard colour TV system (PAL) with HDTV — **4M**

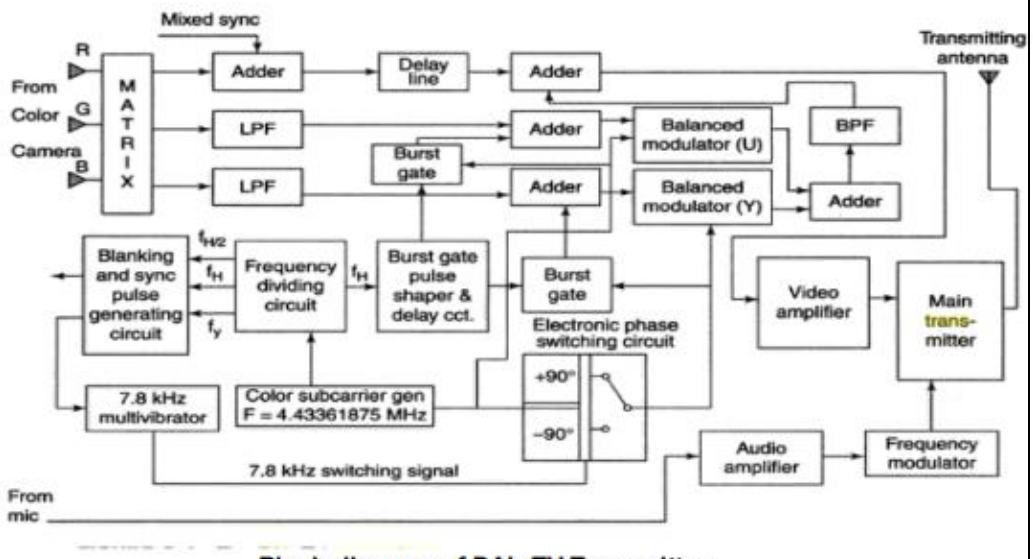
Ans:

Sr. No	PAL	HDTV
1	Phase alternating Line(PAL) is a color encoding systemfor analogue television used in broadcast television systems with less resolution than HDTV	High-definition television (HDTV) is a digital television broadcasting system with greater resolution than traditional television systems PAL.
2	PAL requires more Bandwidth	HDTV requires less bandwidth if sufficient video compression is used.
3	PAL have television standards with 625 lines and 50 fields per second	There were four major HDTV systems tested for example: • EIA monochrome: 4:3 aspect ratio, 1023 lines, 60 Hz • NHK color: 5:3 aspect ratio, 1125 lines, 60 Hz • NHK monochrome: 4:3 aspect ratio, 2125 lines, 50 Hz • BBC colour: 8:3 aspect ratio, 1501 lines, 60 Hz
4	PAL generally broadcast in one of two fromats;25p and 50i	HDTV is broadcast in one of two formats; 720p and 1080i
5	PAL does not provide an increase in picture resolution, 16:9 widescreen as standard, and the ability to support multi-channel audio such as Dolby Digital.	HDTV provides increase in picture resolution, 16:9 widescreen as standard, and the ability to support multi-channel audio such as Dolby Digital.

Any four points 1M each

e) Draw block diagram of PAL TV transmitter. — **4M**

Ans: Diagram: — **4M**



Block diagram of PAL TV Transmitter.

	f)	**Describe the features and characteristics of HD signal transmission.**	**4M**
	Ans:	**Features and characteristics of HD signal transmission: (Any 8) ½ M each** 1. Improvement in both vertical and horizontal resolution of the reproduced picture by approximately 2:1 over existing standards much improved colour rendition (reproduction). 2. Higher aspect ratio of at least 5:3. 3. Stereophonic sound. 4. 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. 5. 1125 scanning lines per frame. 6. 60 fields per second. 7. 2:1 interlace scan. 8. Aspect ratio 16:9. 9. Bandwidth 10MHz 10. Luminance signal Y = 20MHz 11. Sample per active line: 1920 12. Wide band colour signal: 7MHz 13. Narrow band colour signal: 5.5MHz	**½ marks each. (Any eight)**