

TELEVISION AND VIDEO ENGINEERING**UNIT 1****FUNDEMENTALS OF TELEVISION**

1. Mention the various factors which are necessary for the successful transmission and reception of pictures.
 - 1) Geometric form and Aspect ratio
 - 2) Image continuity
 - 3) Number of Scanning lines
 - 4) Scanning
 - 5) Picture Resolution
 - 6) Brightness Gradation and color characteristics
2. Justify the reason of having rectangular frame with width to height ratio 4:3 in TV system.
 - 1) The frame size of the motion picture which already exists is having the aspect ratio 4:3. So by using the same ratio for TV frame, we can telecast motion pictures in TV screen without wasting any portion.
 - 2) In real life, most of the objects are moving only in the horizontal plane.
 - 3) Our eye see the movement of objects comfortably only in horizontal direction than in the vertical direction.
3. Define visual acuity?
Visual acuity can be defined as the ability of human eye to resolve finer details in a picture.
4. What is meant by persistence of vision?
The persistence of vision refers to the storage characteristics of the eye. When the nerves of the retina are stimulated by the incident light, the sensation produced will not cease immediately after the light is removed but persists for about $1/16^{\text{th}}$ of a second.
5. Define luminous intensity.
It is the measure of light intensity responsible for stimulating visual sensation.

6. Define aspect ratio.

Aspect ratio can be defined as the ratio of width to height of the picture frame. For television, it is standardized as 4:3.

7. Define luminous flux.

Luminous flux can be defined as the radiated luminous power or power of visible light expressed in terms of its effect on the average or normal human eye.

8. Define luminance.

Luminance can be defined as the quantity of light intensity emitted per square centimeter of an illuminated area.

9. Mention some important characteristics of human eye?

Visual acuity, persistence of vision, brightness and color sensation are some of the important characteristics of human eye.

10. What are rods and cones?

The retina of the human eye consists of light sensitive cellular structures of two kinds namely rods and cones. The rods sense primarily the brightness levels including very faint impressions. The cones are mainly responsible for color perception. There are 65 lakhs cones and about 10 crores rods connected to the brain through 8 lakhs optic nerve fibers.

11. How the illusion of continuous motion is produced on the TV screen?

If the scanning rate per second is more than 16 or the number of pictures shown per second is more than 16, the eye is able to integrate the changing levels of brightness in the scene. So, when picture elements are scanned rapidly enough, they appear to the eye as a complete picture unit.

12. What is Scanning?

Scanning is a method used to convert electrical signal to picture signal and vice versa.

13. Why is scanning necessary in television system?

Scanning is the important process carried out in a television system in order to obtain continuous frames and provides motion of picture. The scene is scanned both in the horizontal and vertical directions simultaneously in a rapid rate. As a result sufficient number of complete picture of frames per second is obtained to give the illusion of continuous motion.

14. What is horizontal scanning?

Horizontal scanning is the process in which the electron beam is moving from left to right and again from right to left on the picture.

15. What is vertical scanning?

Vertical Scanning is the process in which the electron beam is moving from top to bottom and again from bottom to top to convert the picture elements in to electrical signals.

16. What do you understand by flicker?

The result of 24 pictures per second in motion pictures and that of scanning 25 frames per second in television pictures is enough to make an illusion of continuity. But, they are not rapid enough to permit the brightness of one picture or frame to blend smoothly in the next through the time when the screen is blanked between successive frames. This develops in a definite flicker of light that is very irritating to the observer when the screen is made alternately bright and dark.

17. How flicker problem is reduced in motion pictures?

The flickering problem is reduced in motion pictures by showing each picture twice. Hence 50 views of the scene are shown per second although they are still the same 25 pictures frames per second. As a result of the increased blanking rate, flicker is removed. In TV, Interlaced scanning is used to avoid flicker

18. What do you meant by interlaced scanning?

When the scanning 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. Hence the total number of lines is divided into two groups called fields. Each field is scanned alternately. This way of scanning is called interlaced scanning.

19. Why the number of scanning lines in a frame is always odd?

Let the number of scanning lines in a field is X

Then the number of scanning lines in a frame is $2X$

Because of 2 half lines (one at the end of odd field and the other at the beginning of even field) the total number of scanning lines in a frame is $2X+1$ which is always odd.

20. What is Horizontal and vertical scanning frequency for Progressive and Interlaced scanning?

Frequency	Progressive scanning	Interlace Scanning
Horizontal Scanning	15,625 Hz	15,625 Hz
Vertical Scanning	25 Hz	50 Hz

21. Why the number of scanning lines is limited?

- 1) Increase in number of scanning lines with increase the channel bandwidth
- 2) If the number of scanning lines increases, thickness of the scanning beam will not be very small
- 3) If the number of scanning lines increases, cost of the system will also increase.

22. How many Horizontal lines will be lost during each vertical retrace?
During each vertical retrace 20 Horizontal lines will be lost. Therefore, in a frame, 40 Horizontal lines will be lost during 2 vertical retrace.
23. What do you mean by Resolving power or Picture Resolution?
It is the ability of the image reproducing system to represent the fine structure of an object.
24. Define vertical resolution?
The capability of resolving picture details in the vertical direction is called vertical resolution.
25. What is horizontal resolution?
The ability of the system to resolve maximum number of picture elements along the scanning lines determines horizontal resolution.
26. Define Brightness.
Brightness is the overall or average intensity of illumination and it determines background light level in the reproduced picture.
27. Define Contrast.
Contrast is the difference in light intensity between black and white parts of the picture over and above the average brightness level.
28. List the contents of a composite video signal?
Composite video signal consists of a camera signal, blanking pulses and synchronizing pulses.
29. What do you mean by pedestal?
The difference between the black level and blanking level is known as the pedestal.
30. Define peak-white level?
The peak-white level is defined as the level of the video signal when the picture detail being transmitted corresponds to the maximum whiteness to be handled.
31. Define pedestal height?
Pedestal height is the distance between the pedestal level and the average value axis of the video signal.
32. What is the main function of the blanking pulses?
The composite video signal consist of blanking pulses to make the retrace lines invisible by increasing the signal amplitude little above the black level of 75percent during the time scanning the circuits develop retrace.
33. What are pre and post equalizing pulses?
To rectify the drawback which occurs on account of half-line discrepancy five narrow pulses are added on either side of the vertical sync pulse. These are called pre-equalizing and post-equalizing pulses.

34. Mention the major function of the camera tube?

The major function of the camera tube is to convert an optical image into electrical signals.

35. Differentiate monochrome and color camera tube.

In black and white camera only one pickup tube is needed but three such tubes or its equivalent is necessary in color cameras to develop separate signals for red, green and blue information present in the scene.

36. What do you understand by image storage capability of a pick up tube?

In modern pick up tubes, the effect of illumination on every picture element is allowed to accumulate between the times it is scanned in successive frames. This is called image storage capability of pick up tube.

37. What are the characteristics of Camera tube?

Camera tube has the following characteristics.

- 1) Light transfer characteristics.
- 2) Spectral response
- 3) Sensitivity
- 4) Dark current
- 5) lag characteristics.

38. What are Lag characteristics?

It is the ability of the photosensitive layer to follow faster changes in illumination on the camera tube.

39. What are the different photoelectric effects used for converting variations of light intensity into electrical variations?

The different photoelectric effects used for converting variations of light intensity into electrical variations are

- 1) Photoconductive effect
- 2) Photoelectric effect
- 3) Photovoltaic effect

40. What is Photoconductivity?

When light falls on certain material, the conductivity or resistivity varies according to the intensity of light falling on it. This property is called Photoconductivity.

41. What is Photoemission?
When light is made incident on a photocathode, the photons give away their energy to the outer valence electrons to allow them to overcome the potential energy barrier at the surface. The number of electrons which can overcome the potential barrier gets emitted depending on the light intensity and the process is called photoemission.
42. What is Photoconductivity?
In this method, the conductivity or resistivity of the photosensitive surface varies in proportion to the intensity of light focused on it.
43. What is photovoltaic effect?
The effect in which a potential difference is developed across a semiconductor junction when light falls on it is called photovoltaic effect.
44. What are the advantages of Vidicon?
1) Resolution is high.
2) Long life and small size.
3) By varying the target voltage, it can be operated at different levels of sensitivity.
4) Gamma cancellation circuit is not necessary.
45. What are the disadvantages of Vidicon?
1) High dark current
2) Poor sensitivity
3) High image lag
46. What are the advantages of Plumbicon?
1) Reduced lag
2) Higher sensitivity
3) Medium size and compact
47. What are the disadvantages of Vidicon?
1) High cost
2) Spectral response is poor for red color region.
48. What are the advantages of silicon diode array vidicon?
1) Low dark current.
2) Good resolution
3) High sensitivity
4) Long life and lightly overloaded.
49. What are the disadvantages of Silicon diode array vidicon?
1) Speed of response is not good.
2) Dark current is temperature dependent
50. What are the advantages of Solid state image scanners?
1) No need for electron gun and electron beam.
2) No need for high voltage.
3) No need for vacuum envelope.

51. What is Picture tube?

The picture tube is a special form of cathode ray tube, the face plate of which serves as screen of the television receiver. It is used to convert electrical signal to light signal.

52. What is the working principle of picture tube?

Picture tube works on the principle of Electrostatic focusing and Electromagnetic deflection.

53. What do you mean by Deflection angle?

It is defined as the maximum angle through which the electron beam can be deflected without striking the sides of the bulb.

54. Why an Aluminum coating is provided on the Phosphor screen?

- a) To increase brightness and contrast as it reduces reflection of light back into the tube.
- b) To deflect heavy ions so that ions do not reach the phosphor screen.

55. How pincushion error is reduced in picture tube?

Pincushion error is reduced by adding 2 pincushion error magnets in the deflection yoke which is present at the neck of the picture tube.

56. What is dark current?

The minimum current that is produced in the absence of light is called Dark current.

57. Mention the various adjustments used to produce a perfect raster on the screen.

- a) Positioning of yoke
- b) Beam centering
- c) Pincushion error correction magnets

58. What is the purpose of Blanking Pulses?

Blanking pulses are used to make the retrace path invisible. Horizontal blanking pulses are used to hide the horizontal retrace path and the vertical blanking pulses are used to make the vertical retrace path invisible.

59. What are Sync pulses?

The Synchronizing pulses called 'Sync' are part of the composite video signal at the top 25% of the signal amplitude. The sync pulses include horizontal, vertical and equalizing pulses. Sync separator separates these signals from the video signal.

60. Mention the duration of various pulses used in the composite video signal.

S.No	Type of pulses	Duration
1.	Horizontal blanking pulse	12 μ S
2.	Vertical blanking pulse	1280 μ S
3.	Horizontal synchronizing pulse	4.7 μ S
4.	Vertical synchronizing pulse	160 μ S
5.	Pre equalizing pulses	160 μ S
6.	Post equalizing pulses	160 μ S

61. What are serrated pulses?
It is necessary to cut slots in the vertical synchronizing pulses at half line intervals to provide horizontal synchronizing pulse at the correct instances both after even and odd fields. This insertion of short pulses is known as Notching or Serration and the pulses are called serrated pulses.
62. What are the functions of vertical pulse train?
- 1) Triggering pulses of field oscillator is derived from vertical synch pulses.
 - 2) Horizontal oscillator receives triggering pulses during vertical blanking period due to the serrated pulses.
 - 3) Vertical synch pulses are available at the end of the line after second field and at the middle of the line at the end of first field.
 - 4) To avoid timing error occurred at the vertical oscillator, equalizing pulses are provided and the shape of the vertical trigger pulse is maintained both in even and odd field.
63. Mention the requirements of high level modulation?
In high level modulation, the video signal has to be modulated by the picture carrier in the final power amplifier which has a high power level. Grid bias modulation is employed.
64. What do you understand by ground waves?
Vertically polarized electromagnetic waves are radiated at zero or small angles with ground. They are guided by the conducting surface of the ground along which they are propagated. Such waves are known as ground or surface waves. As the ground waves travel along the surface of the earth, their attenuation is proportional to frequency. The attenuation is reasonably low below 1500KHz. Therefore, all medium wave broadcast and long wave telegraph and telephone communication is carried out by ground wave propagation.

65. What are sky waves?

In ground wave propagation, frequencies above 1600 KHz does not serve any useful purpose as the signal gets very much attenuated within a short distance of its transmission. Therefore, most radio communication in short wave bands up to 30MHz is carried out by sky waves. When these waves are transmitted high up in the sky, they travel in the straight line until the ionosphere is reached. This region begins about 120Km above the surface of the earth. The region consists of large concentrations of charge gaseous ions, free electrons and neutral molecules. The ions and free electrons cause to band all passing electromagnetic waves.

66. Describe briefly about space wave propagation.

Propagation of radio waves above about 40MHz is not possible through either sky wave or surface wave propagation. Therefore, the only alternative for transmission in the VHF and UHF bands, despite large attenuation is by radio waves which travel in a straight line from transmitter to receiver. This called space wave propagation.

67. What is positive modulation?

The type of modulation in which the modulated video signal amplitude increases with the increase in the brightness of the picture is called Positive modulation.

68. What is Negative modulation?

The type of modulation in which the modulated video signal amplitude decreases with the increase in brightness of the picture is called Negative modulation.

69. Mention the advantages VSB modulation.

- 1) Channel bandwidth is reduced.
- 2) Reduction in transmitted power.

70. State the advantages of Negative modulation.

- a) Less Interference of noise on picture signal
- b) Requires less transmitter power
- c) Easy to set the reference level for AGC circuits in receivers

71. What kind of modulation is used for sound signal? Why?

FM modulation is used for transmitting sound signal. Because

- 1) It has less noise interference
- 2) It reduces adjacent channel interference
- 3) It reduces co channel interference.
- 4) It has high transmitter efficiency.

72. Why AM is chosen for video signal?
- 1) Less circuit complexity
 - 2) Less Bandwidth requirement
 - 3) Distortion arise due to interference between multipath signal is severe in FM than AM
 - 4) If FM were used, the changing beat frequency will produce a moving bar interference pattern on the image
 - 5) If AM were used, only steady ghost images are produced.

UNIT 2

MONOCHROME TELEVISION TRANSMITTER AND RECEIVER

73. What is Ghost Interference?
Ghost interference arises as a result of discrete reflections of the signal from the surface of hills, bridges, buildings, towers etc.
74. What is Dipole array?
Dipole antenna is used for band I&III transmitters. It consists of dipole panels mounted on the four sides at the top of the antenna tower. Each panel has an array of full wave dipoles mounted in front of reflectors. To get a unidirectional pattern, the four panels mounted on the four sides of the tower are so fed that the current in each lags behind the previous by 90 degree. This is done by changing the field cable length by $1/4$ to the two alternate panels and by reversal of polarity of the current.
75. Why do we prefer horizontal polarization for television receiving antenna?
We prefer horizontal polarization for television receiver antenna because it results in more signal strength, less reflection and reduced ghost images.
76. Where can you employ indoor receiver antennas?
In strong signal areas it is sometimes feasible to use indoor antennas provided the receiver is sufficiently sensitive.
77. What is the use of Yagi Uda Antenna?
A yagi antenna with a large number of directors is commonly used with success in fringe areas for stations in the vhf band.
78. What do you understand by diplexer?
The outputs of both the video and the audio transmitter are combined by the diplexer circuit and given to a common broadcast transmitting antenna.

79. What is the function of RF amplifier in a TV receiver?

RF amplifier is used for the following purposes.

- 1) RF amplifier act as a buffer stage between antenna and local oscillator.
- 2) They reject image frequency signals.
- 3) They prevent radiation from the local oscillator.
- 4) They provide good selectivity by rejecting unwanted signals.

80. What is the purpose of an AGC circuit in a TV receiver?

To vary the gain of a receiver according to the strength of the signal picked up by the antenna. It is used to control the gain of RF & if stages in the receiver to keep the output at the video detector almost constant despite changes in the input signal to the tuner.

81. What are the factors that influence the choice of IF frequencies?

- 1) Image rejection ratio
- 2) Pick up due to local oscillator radiation from TV receivers
- 3) Image frequencies should not lie in the FM band
- 4) Interference or direct pick up from bands assigned for other services.
- 5) Gain

82. Write the use of AFC circuits in the receiver?

IT is used to eliminate the effect of sharp noise pulses. It results in excellent line oscillator stability and immunity from noise interference.

83. Mention the reason for DC insertion in a TV receiver.

It is needed to preserve DC component and maintain the line representation of the picture.

84. What is the need of AFT in the receiver?

- 1) Mistuning can cause a weak picture with interference or colour.
- 2) Mistuning results in loss of color information

85. What are Noise cancellation circuits?

These are used to cut or cancel the noise prior to video amplifier so that noise signal will not enter the synch separator and AGC circuits.

86. What is co channel interference?

2 stations operating at the same frequency are called Co channel stations. If the co channel stations are located close to each other, then they interface with each other.

87. What is adjacent channel interference?

Stations located close by and occupying adjacent channels are called adjacent channel stations and the interference caused due to the beat between those 2 frequencies or between a carrier any side band is called adjacent channel interference.

88. How to eliminate adjacent channel interface?
1. Sharply tuned band elimination fillers called as trap circuits should be used in the IF section of the receivers.
 2. Use guard band between adjacent channels.
 3. Distance between adjacent channel stations should be maintained around 150km.
89. Mention the important sections of a Monochrome TV receiver?
1. Antenna
 2. RF tuner
 3. Video signal & AGC
 4. Audio signal
 5. Synchronization separator
90. Define Image rejection ratio.
Image rejection ratio is defined as the ratio of the output due to desired station to the output due to image signal.
91. What do you refer by Yagi uda Antenna?
This is a widely used antenna for television receivers .Generally, for locations within 40 to 60Km from the transmitter is the folded dipole with one reflector and one director. This is commonly called Yagi antenna or Yagi-Uda antenna.
92. Name the essential parts of TV transmitter.
The essential parts of TV transmitter includes a video processing unit . A visual modulator which is a diode bridge modulator, phase compensator or delay equalizer and frequency converter.
93. What is the main purpose of using VHF tuner?
The purpose tuner unit is to amplify both picture and sound signals picked up the antenna and to convert the carrier frequencies and their associated side bands into intermediate frequencies.
94. Name the essential components of RF section.
RF tuner section consists of RF amplifier, mixer and local oscillator and is normally mounted on a separate subchassis, called the front end.
95. What are the major tasks of video detector?
The video detector is designed to recover composite video signal and to transform the sound signal to another lower carrier frequency.
96. Why is video amplifier required?
The amplitude of the composite video signal at the output of video detector is not enough to drive the picture tube directly. Therefore further amplification is required. This is done by video amplifier.
97. Define frequency Distortion.
The inequality in gain at different frequency components of the received signal is called frequency distortion.

98. List out the uses of IF sections.

The main uses of this section is

- 1) To amplify modulated IF signal over its entire bandwidth with an input of about 0.5mV signal from the mixer to deliver about 4V into the video detector.
- 2) To equalize amplitudes of sideband components, because of vestigial side band transmission.
- 3) To reject the signals from adjacent channels.

99. Write short notes on AGC circuit.

AGC circuit is used to control the gain of RF and IF amplifiers. The changes in gain is achieved by shifting the operating point of transistors used in the amplifiers. The operating point is changed by a bias voltage that is developed in the AGC circuit.

100. Mention the requirements of AGC.

- 1) Provision should be made in the AGC circuit to convert the video signal from video amplifier into DC voltage to control the gain of RF and IF amplifiers.
- 2) AGC circuit must act fast to control the gain of RF and IF stages.
- 3) The AGC to RF amplifier must be delayed to increase the gain for weak signal.
- 4) Depending upon the signal strength received from the antenna, the AGC must to produce different AGC bias voltages to control gain of RF and IF stages.

101. What are the merits of AGC?

- 1) Intensity and contrast of the picture, once set with manual controls remain almost constant despite changes in the input signal strength from the antenna.
- 2) Contrast in the reproduced picture does not change much when the receiver is switched much from one channel to another.
- 3) Amplitude and cross modulation distortion on strong signals is avoided due reduction in gain.
- 4) AGC also permits increase gain for weak signals. This achieved by delaying the application of AGC to the RF amplifier.
- 5) Flutter in the picture due passing aero planes and other fading effects are reduced.
- 6) Sound signal being a part of composite video signal is also controlled by AGC and thus stays constant at the set level.
- 7) Separation of synch pulses becomes easy.

102. What do you mean by Peak AGC system?

The system based on sampling the sync tip levels is known as “peak” AGC system. The Peak AGC system is also called as non-keyed AGC system.

103. What are the two types of AGC control?

- Forward AGC control
- Reverse AGC control

104. What is Forward AGC control?

In any transistor amplifier, gain is varied by shifting the operating point either towards collector current cutoff or saturation. This actually varies beta of the transistor and hence the stage gain changes. When gain is changed by shifting the operating point towards current cutoff, then it is called "Reverse AGC".

105. What is forward AGC?

In any transistor amplifier, gain is varied by shifting the operating point either towards collector current cutoff or saturation. This actually varies beta of the transistor and hence the stage gain changes. When gain is changed by shifting the operating point towards collector current saturation, then it is called "Forward AGC".

106. List the draw backs of nonkeyed AGC.

The AGC voltage developed across the peak rectifier load tends to increase during vertical sync pulse periods because the video signal amplitude remains almost at the peak value every time vertical sync pulses occur. This results in a 50Hz ripple over the negative AGC voltage and reduces gain of the receiver during these intervals. The reduced gain results in weak vertical sync pulse which in turn can put the vertical deflection oscillator out of synchronism causing rolling of the picture.

107. Merits of Keyed AGC system.

AGC voltage developed is a true representation of the peak of fixed sync level and thus corresponds to the actual incoming signal strength.

Noise effects are minimized because conduction is restricted to a small fraction of the total line period.

108. Why AGC is not applied to the last IF stage?

AGC is not applied to the last IF stage because

- 1) The large amplitude input signal at this stage must result in amplitude distortion.
- 2) Since AGC control is proportional to stage gain, it should be applied to only first one or two stages of IF amplifier with small input signals.

109. What are Noise cancellation circuits?

Noise cancellation circuits are used to cut or cancel the noise prior to video amplifier so that noise signal will not enter the synch separator and AGC circuits.

110. Mention some of the commonly used Noise cancellation circuits.

- 1) Diode noise gate circuit.
- 2) Separate noise gate amplifier circuit.

111. What do you mean by wormy picture?
Due to the frequency variation in the sound signal the wiggles or waves in the lines are created. This effect is called as Wormy picture.
112. Mention some of the commonly used oscillators in discrete deflection circuits.
The commonly used oscillators in discrete deflection circuits are
- 1) Blocking oscillator
 - 2) Multivibrator
 - 3) Complementary pair relaxation oscillator
113. What is meant by high level modulation?
In high level modulation occurs in the output circuit of the final amplifier.
114. What is the value of IF for picture & sound signal?
Picture IF=38.9 MHz
Sound IF=33.4 MHz

UNIT 3 ESSENTIALS OF COLOR TELEVISION

115. What are the characteristics of color signal to specify visual information?
The characteristics of color signal to specify visual information are
- 1) Luminance
 - 2) Hue or tint
 - 3) Saturation
116. What do you understand by Hue?
Hue or tint can be defined as the predominant spectral color of the received light. The color of any object is distinguished by its hue or tint.
117. Define Luminance.
Luminance is defined as the amount of light intensity as perceived by the eye regardless of the color.
118. What do you mean by saturation?
Saturation refers to the spectral purity of the color light. It indicates the degree by which the color is diluted by white.
119. What is Chromaticity diagram?
Chromaticity diagram is a graphical representation of primary colors and their mixtures in a convenient space coordinates. Based on the principle of tristimulus value, that the white color is formed by mixing 30% red, 59% green and 11% blue, these diagrams are drawn. It will be in the shape of a Horse shoe.

120. List any three requirements to be satisfied for compatibility in television systems.
- It should have the same bandwidth as the corresponding monochrome signal.
 - The color signal should have the same brightness information as that of monochrome signal.
 - The location and spacing of the picture and sound carrier frequencies should remain the same.
121. What is additive mixing?
All light sensations to the eye are spitted in to three main color groups namely red, blue and green. The optic nerve system integrates the different color Impressions in accordance with the curve to perceive the actual color of the Object.
122. State Grassman's law.
The property of the eye of producing a response which depends on the algebraic sum of the blue, red and green inputs is called Grassman's law.
123. Explain the significance of generating color difference signals.
Color difference signals are generated to avoid the separate transmission of R, G, B signals.
124. Why is (G-y) not suitable for transmission?
- The proportion of G is large in luminance signal; hence magnitude of (G-Y) is relatively small so it requires amplifiers at the receiving end.
 - It affects the signal to noise ratio at the transmitting end.
125. What is gamma correction?
A color camera is used develop three voltages proportional to red, green and blue Color contents of the picture. These voltages are represented as R, G, and B. A Correction is applied to these voltages to compensate for any nonlinearity of the System and that of the picture tube. This is called gamma correction. i.e. The camera Tube output voltage amplitudes are normalized to I V p-p level.
126. What do you mean by compatibility?
Compatibility means that a color TV signal can produce a black and white Picture on a monochrome receiver and signals from a black and white system can provide a monochrome picture on a color receiver.
127. What do you meant by Reverse compatibility?
A color TV receiver must able to produce a black and white picture using the normal monochrome signal. This is called Reverse compatibility.
128. What are Primary colors?
The three primary colors are Red, Green and Blue. These are called primary colors because any different colors can be produced by properly mixing these three colors.

129. What are complementary colors?

Cyan, Magenta and Yellow are called complementary colors. These colors are produced by properly mixing the primary colors.

130. Mention the different types of color picture tubes.

The different types of color picture tubes available are

- 1) Delta Gun color picture tube
- 2) Precision in line or Gun in line color picture tube
- 3) Trinitron or cathode in line color picture tube

131. How the three electron guns are arranged in Delta gun color picture tube?

In Delta Gun color picture tube the three electron guns are spaced equally at 120° with each other. They are tilted inward with respect to the axis of the tube. The three guns are in the three corners of a Delta.

132. What do you mean by color burst?

In PAL system the two carrier components are suppressed in the balanced quadrature modulator it is necessary to regenerate at the receiver for Demodulation. For this, 8 to 10 cycles of the color sub carrier oscillator output at the encoder are transmitted along with other sync pulses. This sample of the color sub carrier called color burst, is placed at the back porch of each horizontal blanking pulse pedestal.

133. What are the types of color mixing available?

The types of color mixings are

- 1) Additive color mixing
- 2) Subtractive color mixing

134. What are the drawbacks in a Delta gun tube?

- 1) Convergence is difficult
- 2) Focus cannot be sharp over the entire screen.
- 3) Electron transparency of the mask is very low (about 20% only)

135. Why Trinitron picture tube is superior to Delta gun and PIL picture tube?

- 1) Construction is simple.
- 2) Bandwidth is more.
- 3) Electron transparency is more.
- 4) Vertical misconvergence is impossible.

136. What do you mean by Degaussing?

Degaussing means 'Demagnetizing'. It is used to remove magnetic flux from the magnetized metal parts.

137. How color purity is achieved in color picture tube?

In color picture tube, to get pure color each electron beam should land at the centre of the phosphor dot. This precise, alignment of electron beam is done by purity magnets.

138. How pincushion error is eliminated in Color picture tube?
It is not done by permanent magnets. Instead, a dynamic connection method is employed. This connection automatically & increases the horizontal width & vertical size of the shrunken raster due to pincushion distortion.
139. What is Grey scale tracking?
The adjustments to be made in the picture tube of the receivers so that Monochrome information is reproduced correctly without any color tint for all the settings of the contrast control is known as Grey scale tracking.
140. What are the needs for Grey scale tracking?
1. The efficiencies of 3 color phosphors are not same.
2. Electron guns for different colors do not have identical characteristics & cut off points.
141. Mention the adjustments to be made for Grey scale tracking?
The adjustments to be made for Grey scale tracking are
1) Adjustment of low lights
2) Adjustment of High lights
142. What do you mean by Convergence?
Convergence is the technique used to bring the three beams together, so that they hit the same part of the screen at the same time to produce three coincident rasters on the screen.
143. Why convergence error occurs in color picture tube?
Convergence error occurs due to
1) Non uniformity in the deflection field
2) Flat surface of the screen
3) Non coincident convergence plane
144. What are the different types of convergence?
The two types of convergence are
1) Static convergence which involves the movement of beam by permanent magnetic field. This is used to converge the three beams in the central area of the screen.
2) Dynamic convergence which involves the movement of beam by a continuously varying magnetic field.
145. What is Frequency interleaving?
It is the technique used to send the color information with the monochrome signal without any disturbance.

146. What are weighting factors?

To avoid over modulation, we have to reduce the amplitude of color difference signal before modulation with sub carrier. To achieve this, the R-Y & B-Y components magnitudes are reduced by multiplying them using a value called as weighting factors.

147. What is the weighting factors used for (R-Y) & (B-Y) signals?

R-Y -- 0.877

B-Y -- 0.493

148. Why is the color signal BW requirements much less than that of Y signals?

For very fine details, the eye cannot able to identify the colors but identify only the brightness. Therefore for color transmission a maximum of 3 MHz BW is enough.

149. What is chroma signal phase diagram?

The diagram which indicates the amplifier & phase angle of color signal is known as chroma signal phase diagram.

150. What are Ident pulses?

'Ident' are the line identification pulses used to identify the proper sequence of color lines in each field.

UNIT 4

COLOR TELEVISION SYSTEMS

151. What is swinging burst?

The PAL burst phase actually swings 45 about the -U axis from line to line and indicates the same sign as that of the V signal; thus the switching mode information is the swinging burst. This is known as swinging burst.

152. What are the Merits of SECAM systems?

SECAM system has several advantages because of frequency modulation of the sub carrier and transmission of one line at a time.

- 1) SECAM receivers are immune to phase distortion.
- 2) No interference between color difference signals.
- 3) No need for QAM and synchronous detector.
- 4) Advantages of FM are available.
- 5) No need for saturation and Hue control.
- 6) No need fro ATC and ACC circuit.
- 7) Receivers are simple compared to NTSC and PAL systems.

153. What are the Demerits of SECAM systems?
- 1) Vertical resolution is inferior to other system. However this is not noticed by human eye due to poor visual perception of color.
 - 2) Hue and Saturation are represented by the sub carrier deviations. Luminances are represented by the amplitude. Thus if any signal fades takes place in the studio, then it affects only the luminance information. This will create more saturation to color signals.
154. What is NIR SECAM system?
The SECAM system developed by the Russian National institute for Research (NIR) is known as NIR SECAM system.
155. What are the Limitations of the NTSC system?
The Limitations of the NTSC system are
- 1) The NTSC system is sensitive to transmission path differences which introduces phase errors that result in color changes in the picture.
 - 2) Phase changes in the chromo signal take place during the change over from outdoor program to studio program at the transmitter side.
 - 3) Phase changes takes place when video tape recorders are switched on.
 - 4) The phase angle is also affected by the level of the signal while passing through various circuits.
 - 5) In addition cross talk between demodulator outputs at the receiver causes color distortion.
156. Mention some features of PAL system.
- a. The weighted (B-Y) and (R-Y) signals are modulated without being given a phase shift of 33 as is done in the NTSC system.
 - b. On modulation both the color difference signals are allowed the same bandwidth of about 1.3MHz.
 - c. The color sub carrier frequency is chosen to be 4.43MHz.
 - d. The weighted color difference signals are quadrature modulated with the sub carrier.
157. Write notes on NTSC system.
NTSC system is compatible with 525 line American system. In order to maintain compatibility two new color difference signals are generated and they are represented as I and Q. Since eye is capable of resolving finer details in the regions around I, it is allowed to have a maximum bandwidth of 1.5MHz. The bandwidth of Q signal is restricted to 0.5MHz.
158. What is the difference between NTSC, PAL and SECAM?
The difference between the SECAM system on one hand and NTSC and PAL on the other is that the later transmit and receive two chrominance signals simultaneously while in the SECAM system only one of the two color difference signal is transmitted at a time.

159. What do you mean by high frequency preemphasis?
In SECAM system, the chrominance signals are pre-emphasized before modulation. After modulating the carrier with the pre-emphasized and weighted color difference signals, another form of preemphasis is carried out on the signals. This takes the form of increasing amplitude of the sub carrier as its deviation increases. Such a preemphasis is called high frequency preemphasis.
160. How U & V signals are separated?
Delay line technique is used to separate the U & V color difference signals at the receiver side. The addition & subtraction operations are carried out using transformer action in discrete circuits.
161. What is the use of line identification pulses?
In SECAM system, the switching of Dr and Db signals line by line takes place during the line sync pulse period. The sequence of switching continues without interruption from one field to the next and is maintained through the field blanking interval. However it is necessary for the receiver to be able to deduce as to which line is being transmitted. Such an identification of the proper sequence of color lines in each field is accomplished by identification pulses.
162. Why different bandwidth is assigned to Q and I signal?
Due to limitations of color signal resolving power of human eye, it is found that 1.5 MHz bandwidth for I signal and 0.5 MHz bandwidth for Q signal can able to present good color resolution in NTSC system.
163. Write notes on luminance channel.
The video amplifier in the luminance channel is Dc coupled and has the same bandwidth as in the monochrome receiver. It is followed by a delay line to compensate for the additional delay the color signal suffers because of limited band pass of the chrominance amplifier. This ensures time coincidence of the luminance and chrominance signals. The channel also includes a notch filter which attenuates the sub carrier by about 10db. This helps to suppress the appearance of any dot structure on the screen along with the color picture.
164. What is the use of chrominance band pass amplifier?
The chroma band pass amplifier selects the chrominance signal and rejects other unwanted components of the composite signal.
165. What is color killer circuit?
Color killer circuit prevents color interference on the screen during the monochrome signal perception. When the color killer circuit in 'ON', it disables the chroma band pass amplifier. So no signals reach the color matrix.

166. What are differential phase errors?

Due to the transmitter circuits or the transmission path differences the chroma signals are susceptible to phase shift errors. These errors will change the hue of the reproduced color picture. This type of error is called Differential phase errors.

167. What do you mean by automatic color control?

The ACC circuit is similar to the AGC circuit used for automatic gain control of RF and IF stages of the receiver. It develops a dc control voltage that is proportional to the amplitude of the color burst.

168. What are the merits of PAL system?

The merits of PAL system are

- 1) Differential phase error problem is successfully overcome in PAL system.
- 2) Hue errors are reduced due to the use of Delay technique at the receiver side.
- 3) Manual hue controls are not necessary.

169. What are the Demerits of PAL systems?

- 1) Receiver cost is high.
- 2) PAL system is more complicated and expensive due to the use of PAL technique and delay line in the receiver.
- 3) For magnetic covering, the color coding sequence requires 8 fields in PAL system. But 4 fields are enough in NTSC system.
- 4) Delay line technique creates a reduction in the vertical resolution of the chroma signal.

170. What do you mean by automatic frequency tuning?

AFT is used to improve the stability of the oscillator circuit, some drift does occur on account of ambient temperature changes, component aging, power supply voltage fluctuation and so on. The fine tuning control is adjusted to get a sharp picture.

171. Write short notes on burst separator.

The burst separator circuit has the function of extracting 8 to 10 cycles of reference color burst which are transmitted on the back porch of every horizontal pulse. The circuit is tuned to the sub carrier frequency and is keyed on during the fly back time by pulses derived from the horizontal output stage.

172. What is the use of color sub carrier oscillator?

The function of sub carrier oscillator is to generate a carrier wave output at 3.57MHz and feed it to the demodulators. The sub carrier frequency is maintained at its correct value and phase by the APC circuit.

173. How the phase error is cancelled in the PAL system.

In PAL system phase shift error is cancelled by reversing the phase angle of v signal on alternate lines.

174. Give the abbreviation for NTSC, SECAM and PAL.

NTSC -National Television systems committee

SECAM –Sequential –a-Memoire

PAL - Phase Alteration by Line

175. What do you understand by PAL –D Color system?

The use of eye as the averaging mechanism for the correct hue is the basic concept of simple 'PAL' system. Beyond a certain limit, the human eye see the effect of color changes on alternate lines hence the system needs modification. Considerable improvement found in the system of a delay line is used to do the averaging first and then present the color to the eye. This is called PAL-D or delay line PAL method and is most commonly employee in PAL receivers.

176. What is the use of color demodulator?

The function of color demodulator is to detect the U and V signals and the modulated color signals.

177. What are the needs of color signal processing and mention its various sections.

Color signal processing is done to separate the color signals, burst signals and other signals needed of color separation from the composite color video signal.

The main sections of this unit are

- 1) Chrominance band pass amplifier
- 2) Separation of U and V signals
- 3) Color difference amplifiers and matrix networks

178. Write short notes on color sub carrier frequency of PAL D system.

The color sub carrier frequency of 4.43MHz is produced with a crystal controlled oscillator .To accomplish minimum raster disturbance through the color sub carrier it is important to maintain correct frequency relationship between the scanning frequencies and subcarrier frequency .Therefore ,it is usual to count down from the subcarrier frequency to twice the line frequency pulses .

179. Why SECAM receiver does not need color & saturation control?

The color information in SECAM system is not affected during the transmission because FM modulates will be used for the chroma signal. Hence saturation and Hue controls are not needed here.

UNIT 5**ADVANCED TELEVISION SYSTEM**

180. Write short notes on CATV.
CATV stands for community antenna television systems. The CATV system is a cable system distributes good quality television signal to a very large number of receivers throughout an entire community. Generally this system gives increased TV programmes to subscribers who pay a fee for this service. A cable system may have many more active VHF and UHF channels than a receiver tuner can directly select.
181. What do you understand by satellite TV?
Satellite TV is a TV from space. Broadcasters from earth transmit their programmes to specified satellites. Then, the transmissions are returned to receiving equipment on the ground. Therefore, the better the receiving equipment, the higher is the quality of the reception.
182. List some of the applications of satellite TV?
The sheer range of programmes currently available on satellite channel is very much impressive such as 24-hour music videos, news, and feature films. A variety of general entertainment programmes, sports, children's programmes, foreign language broadcasts and cultural programmes are all available for the keyboard dish owner. Some of these come through subscription channels and others by free to watch channels which are sponsored by advertising.
183. State the merits of satellite TV.
The picture quality from satellite systems is surprisingly good and compares well with conventional land based TV transmissions. In addition unlike terrestrial broadcasts it is free from the spectrum of picture ghosting.
184. Mention the limitations of satellite TV.
The limitation of the satellite TV is varying picture and audio quality. By adopting de-emphasis circuits we can avoid the variations.
185. Give the applications of video tape recorders.
Smaller and lower priced video tape recorders using $\frac{1}{2}$ inch tape are available for closed type circuit TV or for use in the home. They can record and playback programs on a television receiver in color and monochrome. In addition to that small portable cameras are provided for a complete television system with the recorder. These portable systems are also employed for taping television programs from a remote are also employed for taping television programs from a remote location for away from the TV broadcast studio.
186. List some merits of high definition television.
- 1) Improvement in both vertical and horizontal resolution of the reproduced picture by approximately 2:1 over existing standards.
 - 2) Much improved color rendition
 - 3) Higher aspect ratio of at least 5:3
 - 4) Stereophonic sound

187. What do you mean by longitudinal video recording?
A method in which video signals are recorded on several tracks along the length of the tape is called longitudinal video recording.
188. What do you mean by Quadruplex (Transverse) scan recording?
In transverse scan recording, four recording heads are spaced 90 apart and are mounted on a rotating drum and the tape moves past it transversely. Each head comes in contact with the tape as the previous one leaves it.
189. What do you mean by helical scan recording?
In helical scan recording, the two recording heads 'look at' the tape surface as it is drawn past them through two tiny rectangular slits mounted on opposite sides of the drum. The heads thus trace out diagonal tracks across the tape, one track per head.
190. What are two types of video disc system?
Laser or optical disc system
Capacitance disc system
191. List the fundamental components of DVD player.
1) A drive motor to spin the disc.
2) A laser and lens system to focus in on the bumps and read them.
3) Tracking mechanism that can move the laser assembly so that the laser's beam can follow the spiral track.
4) Electronic circuitry
192. What are the advantages of DVD players over VCR's?
The quality of picture and sound in a DVD is better than on a video tape, and DVD's maintain their high quality over time, because there is no physical contact with the disc as it revolves.
193. List 4 merits of digital TV receivers.
 - Reduced Ghosts
 - Reduction of 50Hz flicker
 - High resolution pictures
 - Slow motion action
194. What are the merits of Digital TV receiver?
 - 1) Reduced ghost images
 - 2) Interference from electrical appliances are suppressed
 - 3) Synchronization is better
 - 4) Reduction of 50 Hz flicker
 - 5) Picture resolution is high
 - 6) Picture in picture is possible
 - 7) Improved reception in fringe areas
 - 8) Slow motion action
 - 9) Easy adoption to additional facilities (tele text, video games etc.)

195. What are the basic elements of a projection system?

The basic elements of a projection system are

- 1) Viewing screen
- 2) Optical element
- 3) Image source
- 4) Drive electronics

196. What are the different methods available for large screen display system?

- 1) CRT based display method
- 2) Eidophor reflective optical method
- 3) Talaria transmissive color method
- 4) Dual light valve system for HDTV
- 5) Laser beam projection scanning method
- 6) LCD projection method

197. What do you mean by scrambling of TV signals?

Scrambling is the process in which the picture is made unintelligible to view on the screen.

198. What is Descrambling?

Descrambling is the process in which the scrambled picture is made intelligible to view on the screen.

199. Mention the different scrambling methods.

The different scrambling methods are

- 1) Trap
- 2) SYNC suppression scrambler
- 3) Base band scrambling
- 4) Encryption method

200. What are the digital equipments used in TV studios?

The various digital equipments used in TV studios are

- 1) Digitally controlled cameras
- 2) Electronic character generator
- 3) Digital art or paint box
- 4) Electronic controlled studio lights
- 5) Digital audio recorders
- 6) Computer assisted video and audio editing systems.

201. What do you mean by character rounding?

It is a technique which reduces the step like abruptness and provides a greater degree of smoothness to the characters generated.

202. Why communication satellites are set to orbit at a distance close to 35867 km in the sky from the surface of the earth?

At the height of 35867 km the centrifugal force due to velocity of satellite rotation is equal to the gravitational force towards the earth. So it appears that the satellite is stationary above the earth with respect to a point.

16 MARKS

Unit 1

1. Draw and explain the operation and construction of vidicon camera tube.
2. Draw and explain the working principle and construction of plumbicon camera tube.
3. With neat diagram explain the silicon diode vidicon.

Unit 2

1. With necessary diagram explain the operation of forward and reverse AGC.
2. With neat block diagram explain the operation of Tv transmitter.
3. Draw the block diagram of monochrome Tv receiver and briefly review the nature of input and output signals of various section.
4. Write short notes on propagation of Tv signal.

Unit 3

1. Describe the gun structure and focus details of Trinitron picture tube with neat signal. State its merits and demerits.
2. Illustrate the constructional and focusing techniques employed in PIL color picture tube.
3. What is meant by gray scale tracking? Explain the need and method of obtains a tint free associated while receiving B & W transmission.

Unit 4

1. With a neat block diagram explain the operation of PAL coder.
2. Explain the delay line method of separating U & V signals in PAL receiver.
3. Explain in detail the NTSC color receiver system.
4. Explain in detail the SECAM system.

Unit 5

1. With a help of neat functional diagram explain the operation of digital Tv receiver.
2. Draw the functional block diagram of digital television Tv system and explain the operation.
3. Explain detail about the cable Tv system.
4. Write short notes on 3DTV & EDTV.