SUMMER– 14 EXAMINATION

Subject Code: **17439** **Model Answer** Page No: ____/ N

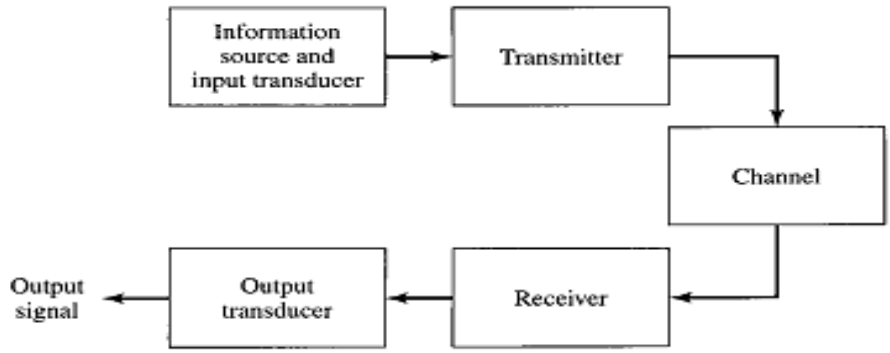
Important Instructions to examiners:

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

1.Attempt any SIX of the following 12

i) Draw the diagram of Electronic communication system.

Ans:-



(2 mks)

ii) Define modulation index in FM? Write its equation.

Ans:-Modulation index (m_f) isdefined as the ratio of maximum frequency deviation to modulating frequency in FM.
(1 mks)

It is given as-

$$m_f = \delta / f_m$$

where δ=maximum frequency deviation

f_m is modulating frequency (1 mks)

iii) Why electromagnetic waves are said to be transverse waves?

Ans:- Electromagnetic waves are said to be transverse waves as the particles oscillate in a direction perpendicular to the direction of propagation of the waves. (2 mks)

iv) List different types of antennas.

Ans:-The different types of antennas are- (any 4 , 2 mks)

1) Yagi uda antenna

2) Dish Antenna

3) Horn antenna

4) Telescopic antenna

v) Define IF with respect to AM radio receiver. Give the value of Intermediate frequency.

Ans:- Intermediate Frequency -The **Mixer in AM receiver** receives signal from the RF amplifier at frequency (fs) and from the local oscillator at frequency fo such that fs > fo. The mixer will mix these signals to produce signals having frequencies fs, fo , (fo + fs) and (fo - fs). Out of these the difference of frequency component i.e. (fo - fs) is selected and all others are rejected. This frequency is called as the intermediate frequency (IF).

(1 mks)

The value of intermediate frequency is 455 Khz for AM. (1 mks)

vi) Why TV width is greater than height ? Define aspect ratio.

Ans:- TV width is greater than height-In human affairs most of the motion occurs in horizontal plane so a larger width is desirable. The eyes can view with more ease and comfort when width of a picture is more than height.

The fovea (the surface of maximum selectivity and resolution at the centre of retina in the eye has greater width than height. The vision due to pair of eyes is in the horizontal plane and the range of movement of both the eye balls is more in horizontal plane as compared to vertical plane. (1 mks)

Aspect ratio-Width to height ratio of a picture frame is called aspect ratio. Standard aspect ratio of 4:3 is preferred for most televisions (1 mks)

vii) What is the function of camera tube in TV.

Ans:- The camera tube goes through 2 function i.e. conversion of optical image into charge image and charge image is scanned to produce video information .Thus it converts the video signal into equivalent electrical signal.

(2 mks)

viii) Compare NTSC and PAL system with respect to field frequency and line frequency.

Ans:-

parameter	NTSC	PAL
Line frequency/Hz	15750	15625
Field frequency/Hz	60	50

b) Attempt any TWO of the following 08

i) Define modulation and explain need of modulation.

Ans:-Modulation:- The process in which any one parameter of a high frequency carrier signal (i.e. either amplitude,frequency or phase)is varied in accordance with the instantaneous value of the modulating signal ,keeping the other two parameters constant.(2 mks)

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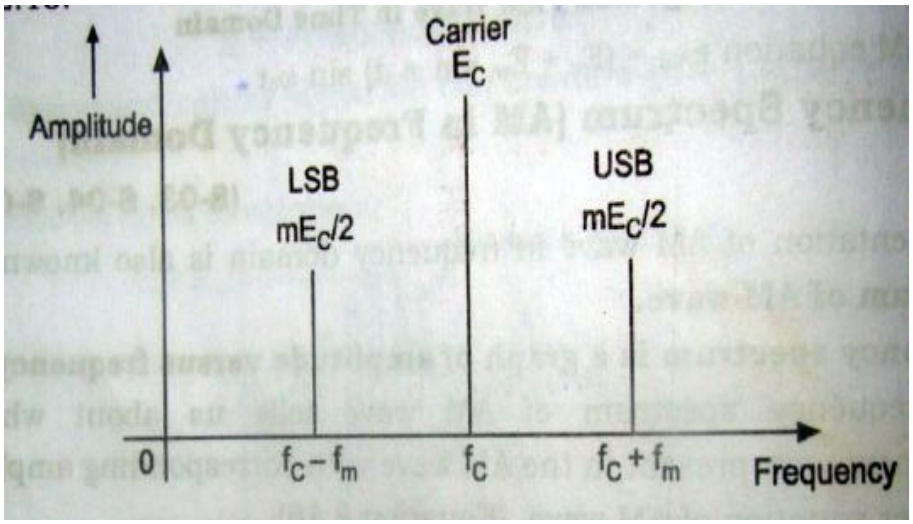
Need of modulation (any 4 points -2 mks)

1. To reduce the height of the antenna.
2. To avoid the mixing of the signals.
3. To increase the range of communication.
4. To make multiplexing possible.
5. To improve quality of reception

ii) Draw the frequency spectrum of AM .List its four features.

Ans:-



(2 mks)

Features:- **(any 4 features ,2 mks)**

1) Expression for an AM wave

$$v = Vc \sin\omega ct + \frac{mVc \cos(\omega ct - \omega mt)}{2} + \frac{mVc \cos(\omega ct + \omega mt)}{2}$$

2) It consists of 3 components,upper sideband, lower sideband and the carrier itself.
3) maximum value of m is 1
4) The carrier carries maximum power (almost 67% of the total power)

iii) Calculate the modulation index if modulating frequency in FM IS 1 Khz and maximum deviation is 1.6Khz and also calculate the bandwidth.
Ans:- Modulation index in FM is given as

$m_f = \delta / f_m$

$= 1.6/1$

$= 1.6$ (2 mks)

Bandwidth $= 2(\delta + f_{m)}$

$= 2(1.6+1)$

$= 5.2$ Khz (2 mks)

2. Attempt any FOUR of the following 16

a) Explain the effect of modulation index on AM with waveforms.

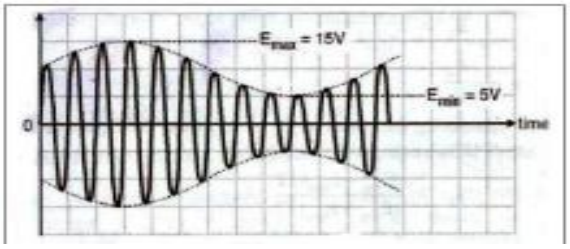
Ans:- The modulation index for AM ranges from 0 to 1and is given as-

$$m = Vm / Vc$$

where, Vm=Modulating signal amplitude

Vc =Carrier signal amplitude (1 mks)

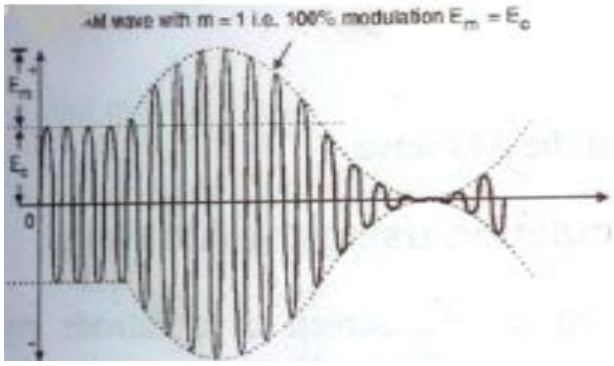
The effect of m on AM is as shown in the figures below-
a) m<1 (m < 100%)- no distortion in the Recovered signal at the receiver.



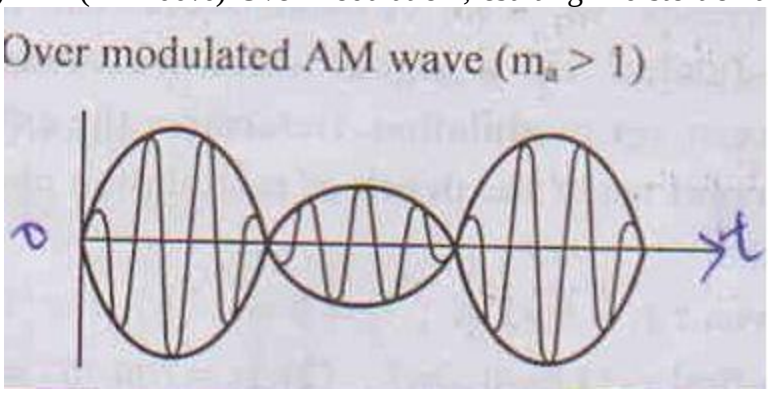
(1 mks)

b) m=1(m=100%)-Distortion occurs at the receiver after demodulation.

(1 mks)



c) m>1 (m> 100%)-Over modulation ,resulting in distortion at the receiver after demodulation.

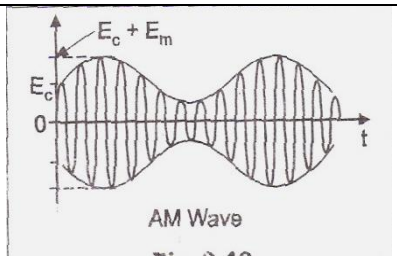
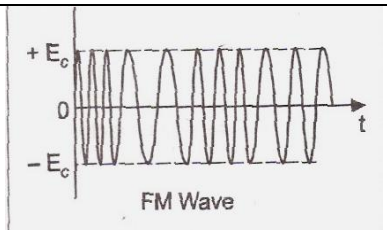


(1 mks)

b) Compare AM and FM (any 4 points)

Ans:-

Parameters	AM	FM
Definition	Amplitude of the carrier is varied in accordancec with the instantaneous value of the modulating signal.	Frequency of the carrier is varied in accordancec with the instantaneous value of the modulating signal.
Modulation index	m= Vm/Vc	M= δ/Fm
No of sidebands	Only 2	infinite
Bandwidth	2Fm	2(δ + Fm)

Modulated signal		

c) Define pulse modulation.Give the types of pulse modulation.

Ans:-Pulse modulation is the process in which a train of pulses is used as the carrier wave ,one or more of its parameters such as amplitude ,being modulated or modified in order to carry information . (2 mks)

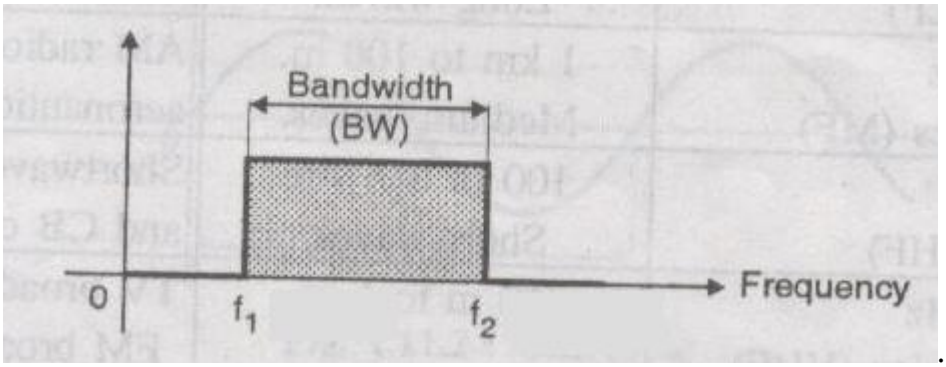
It has two types-

1) Analog-PAM,PPM and PWM

2) Digital-PCM,DM,ADM etc (2 mks)

d) State and explain concept of transmission bandwidth .

Ans:- Transmission bandwidth is the difference between the upper and lower frequency limits of the signal or
the equipment operation range and given as BW = F2-F1 . Also the range of frequencies that contain the
information is called Bandwidth. (2 mks)



. (2 mks)

e) What is electromagnetic polarization? Explain types of [polarization.
Ans:-The direction of the electric field vector in relation to the direction of propagation is called as electromagnetic polarization.For example if the electric field is parallel to the earth's surface, it is called as horizontal polarization . (1 mks)
Types of polarization-
1) Linear- A linear polarization occurs when the electric vector remains in the same plane.It has 2 types-

Horizontal and vertical polarization. (1 mks)

2) Elliptical –If the path traced out by the tip of electric vector is ellipse, then it is called as elliptical polarization (1 mks)

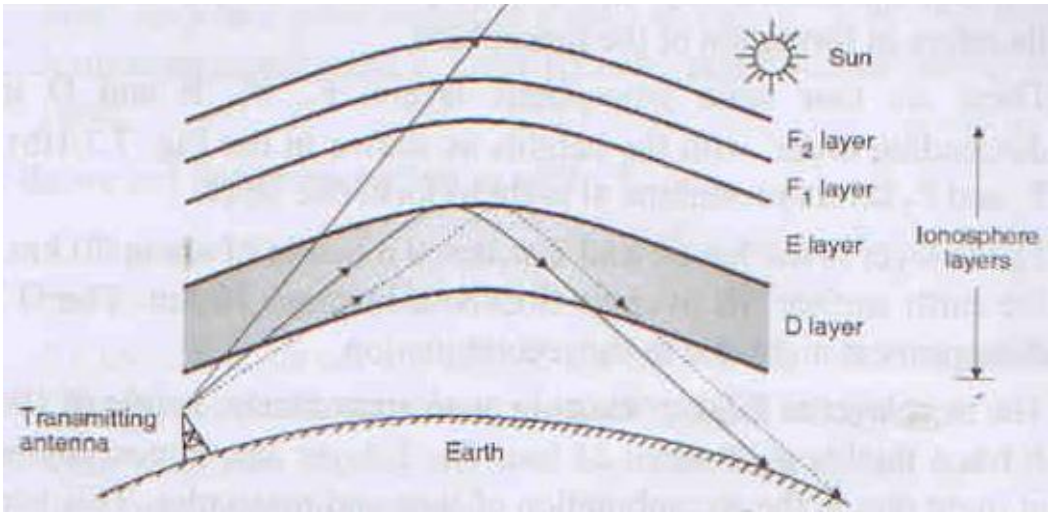
3) Circular- A special case of elliptical polarization which is either right handed or left handed (1 mks)

f) Explain with neat sketch sky wave propagation.

Ans:- **Sky wave propagation-** These waves travels by reflecting (refracting) from ionosphere .

Ionosphere is made up of ions & density of ions increases as height from earth surface increases. As density increases refractive index decreases& because of this change in refractive index wave starts deflecting farther &farther from normal .after reaching to particular height it come backs to earth surface

By using sky wave propagation signal can be send almost anywhere on earth surface .it is not affected by curvature of earth The quality of reception of sky wave is not uniform & constant to all locations & it gets affected by environmental factors. (2 mks)



(2 mks)

3. Attempt any FOUR of the following 16

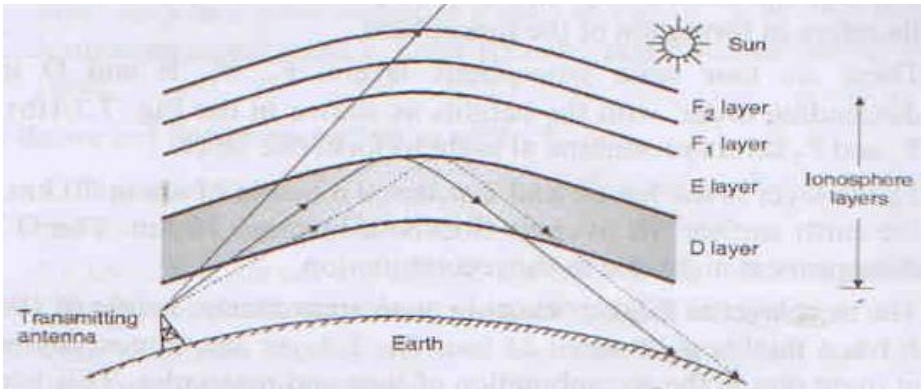
a) Compare PAM,PWM and PPM (any 4 points)

Ans:-

Sr no	PAM	PWM	PPM
1	Amplitude of the pulse is proportional to theamplitude of modulating signal	Width of the pulse is proportional to theamplitude of modulating signal	AThe relative position of the pulse is proportional to theamplitude of modulating signal
2	Noise interference is high	Noise interference is minimum	Noise interference is minimum
3	System is complex	Simple to implement	Simple to implement
4	Bandwidth depends on the width of the pulse	Bandwidth depends on the rise time of the pulse	Bandwidth depends on the rise time of the pulse
5	Transmitted power varies	Transmitted power varies	Transmitted power remains constant

b) Describe various layers of ionosphere.

Ans:-



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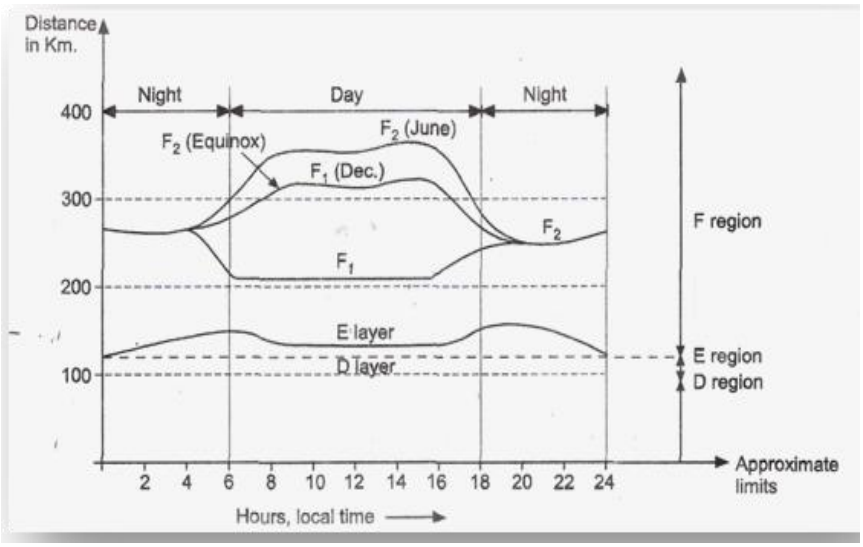


(2 mks)

The ionization of ionosphere is not uniform throughout and it has many layers such as D ,E,F1 and F2 layers because of difference in chemical composition, physical properties at different heights ,unequalities of different gases , absorption of solar radiations etc. Their behavior is different during day time and night time.

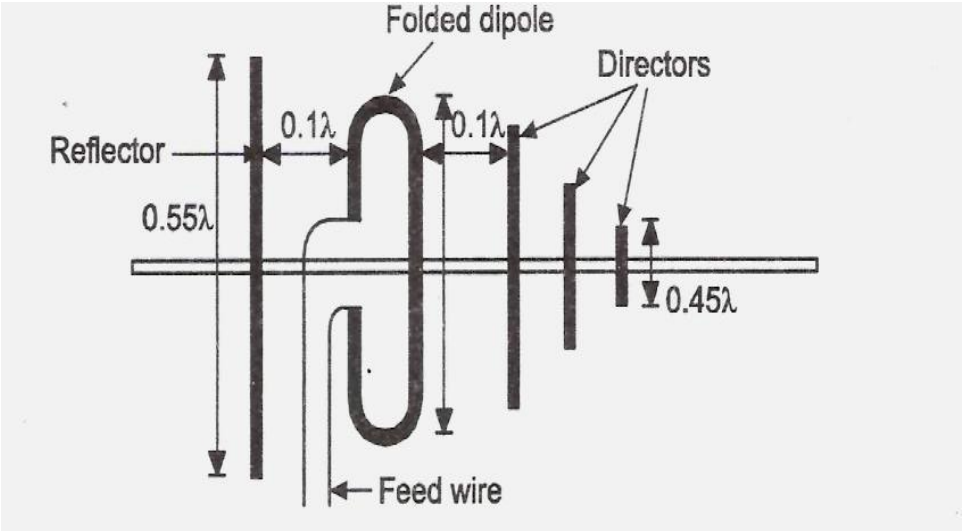
The D layer exits at the height of 90 km and is the ionized layer, offering high day time attenuation to high frequency radio waves.

The E layer is at 110 km and F1 layer at around 220 km height from ground .The F2 layer exits at 250 t0 350 km and has maximum electron density. The F1 and F2 layer merge to form one single layer which may be called F2 layer during night.
(2 mks)

c) List the specifications of Yagi Uda antenna and draw proper diagram of yagi uda antenna.

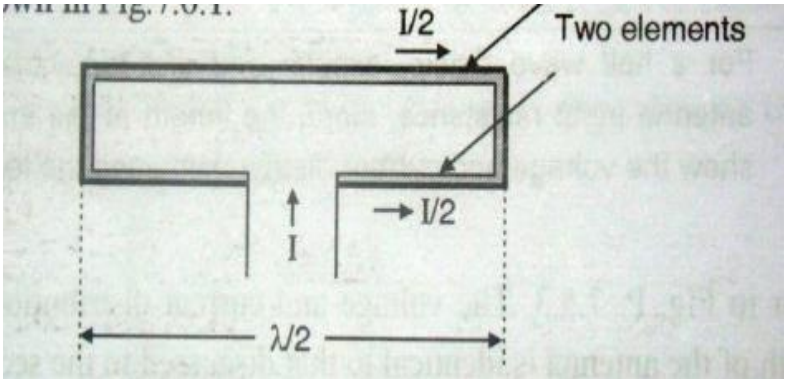
Ans:-Specifications:- (any 4 -2 mks)

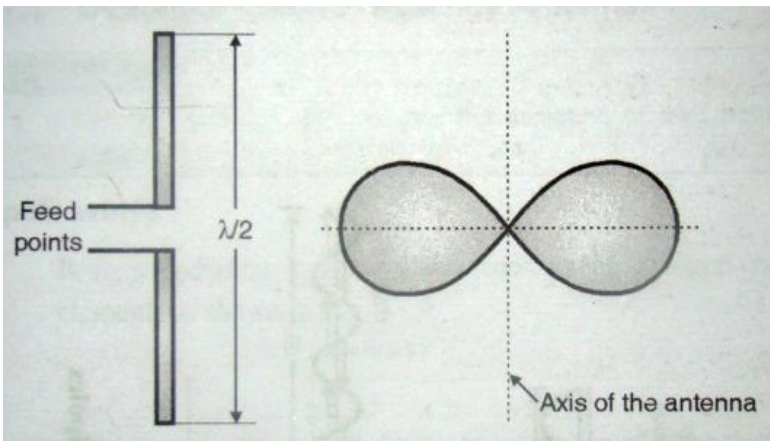
1) The length of folded dipole is λ/2.
2) It provides the gain of 70 dB.
3) It has a unidirectional radiation pattern.
4) They are made of 0.6 to 5 cm to 1.25 cm in diameter dimension pipes of suitable lengths.



(2mks)

d) Draw folded dipole antenna and its radiation pattern.
Ans:- Folded dipole (diagram 2 mks, radiation pattern 2 mks)





e) List the characteristics of non resonant antenna. Draw its radiation pattern.
Ans:- (any 4 characteristics -2mks,radiation pattern -2 mks)
Characteristics-
1)These are properly terminated transmission line by correct termination resistor.

2) For these antennas, standing waves are not present.
3)They have no reflections and has only forward waves.
4)They have unidirectional radiation pattern.

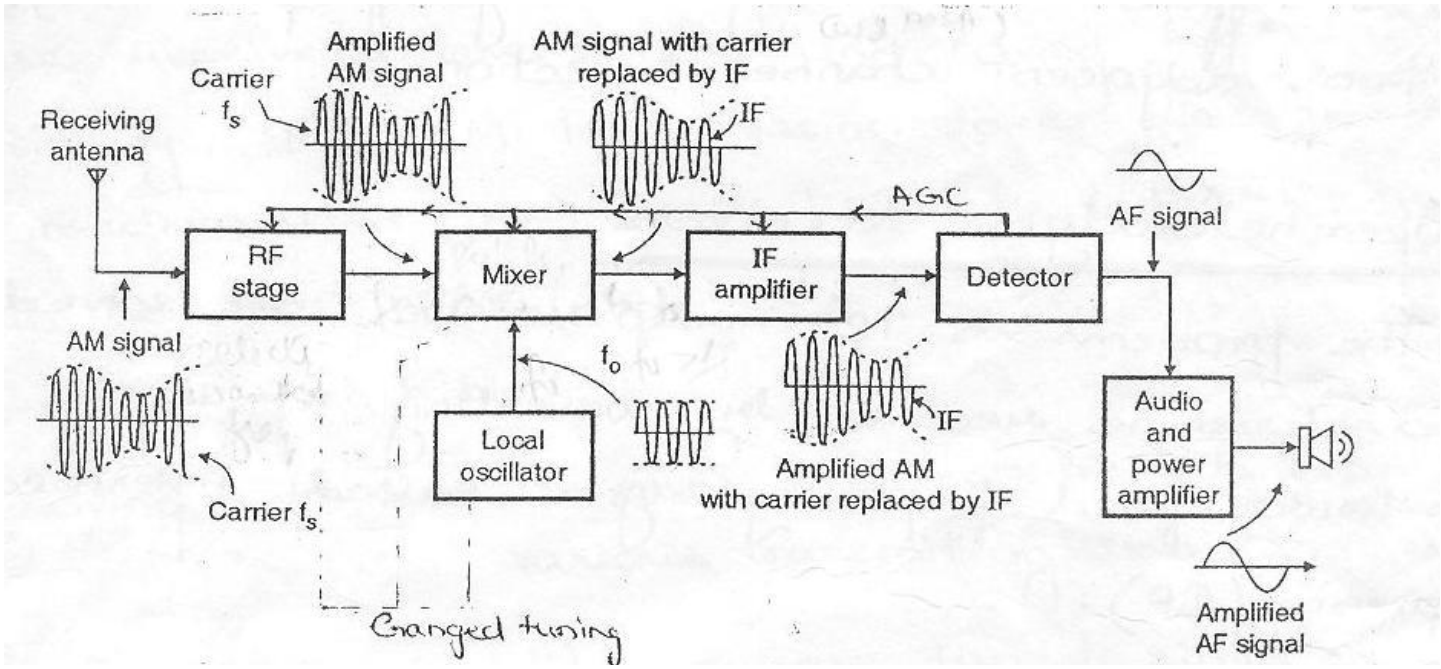
Radiation pattern-

f) Write one applications of following antennas.
Ans:- (1 application 1 mks)

1) Loop antenna-portable receivers, direction finding equipments.
2) Yagi Uda antenna-HF Transmission antenna, VHF TV Receiving antenna
3) Dish antenna-Ship to ship communication, RADAR communication, Satellite communication
4) Horn antenna-At microwave frequencies.

4. Attempt any FOUR of the following 16

a) Draw and explain block diagram of AM superhetrodyne receiver.
Ans:- (Block diagram 2 mks ,explanation 2 mks)



Explanation-The AM signal transmitted by the transmitter travels through the air and reaches the receiving antenna. This signal is in the form of electromagnetic waves. It induces a very small voltage into the receiving antenna.
RF stage is an amplifier which is used to select the wanted signal and reject unwanted ones. It also reduces the effect of noise. At the output of the RF amplifier, we get the desired signal at frequency "fs".

Mixer receiver signal from the RF amplifier at frequency (fs) and from the local oscillator at frequency fo such that fs > fo. The mixer will mix these signals to produce signals having frequencies fs, fo , (fo + fs) and (fo - fs). Out of these the difference of frequency component i.e. (fo - fs) is selected and all others are rejected. This frequency is called as the intermediate frequency (IF).

Ganged tuning
Ganged tuning is used to maintain a constant difference between the local oscillator frequencies and the incoming frequency. This is simultaneous tuning of RF amplifier, mixer and local oscillator and it is achieved by using ganged tuning capacitor.
This IF signal is then amplified by one or more IF Amplifier stages. IF amplifier provide most of the gain and the bandwidth requirements of the receiver.
The amplified IF signal is detected by the detector to recover the original modulating signal. This is then amplified and applied to the loudspeaker

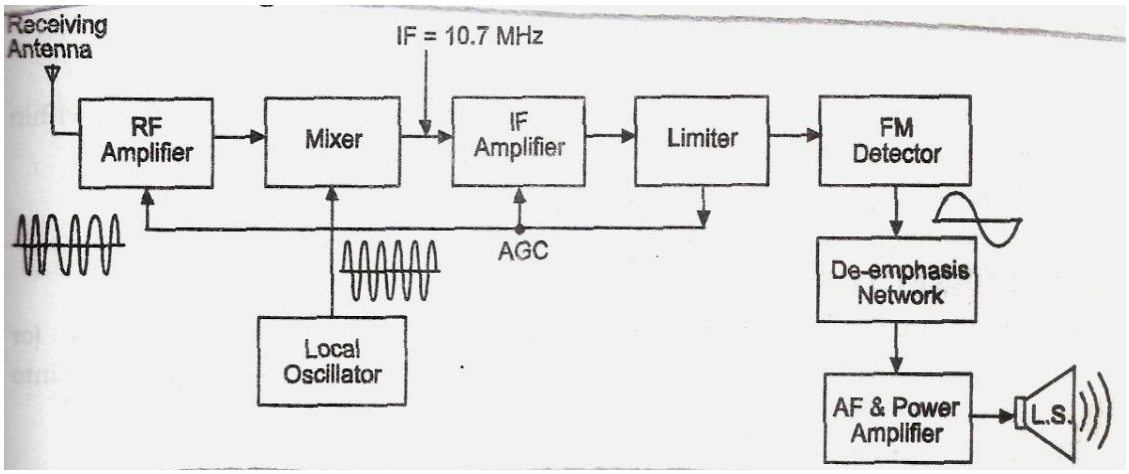
AGC (Automatic Gain Control)
Circuit controls the gain of the RF and IF amplifiers to maintain a constant output voltage level even when the signal level at the receiver input is fluctuating. This is done by feeding a controlling dc voltage to the RF and IF amplifiers. The amplitude of this dc voltage is proportional to the detector output.

b) Define following terms for AM receiver

Ans:- (1 mks for each definition)
i) Sensitivity- Sensitivity for a radio receiver is defined as the ability to amplify weak signals.
It is measured in μV.
ii) Selectivity- Selectivity is defined for a radio receiver as the ability to reject unwanted Signals .
It decides the adjacent channel rejection of a receiver.
iii) Fidelity- is the ability of a receiver to produce faithfully all the audio frequencies with which the carrier is modulated.This is expressed in as a frequency response curve.
iv) Image frequency rejection-Image frequency is defined as the signal frequency plus twice of the intermediate frequency. The ability of radio receiver to reject this image frequency is called as image frequency rejection.

c) Draw the block diagram of FM radio receiver and explain its working.

Ans:- (Block diagram 2 mks ,explanation 2 mks)

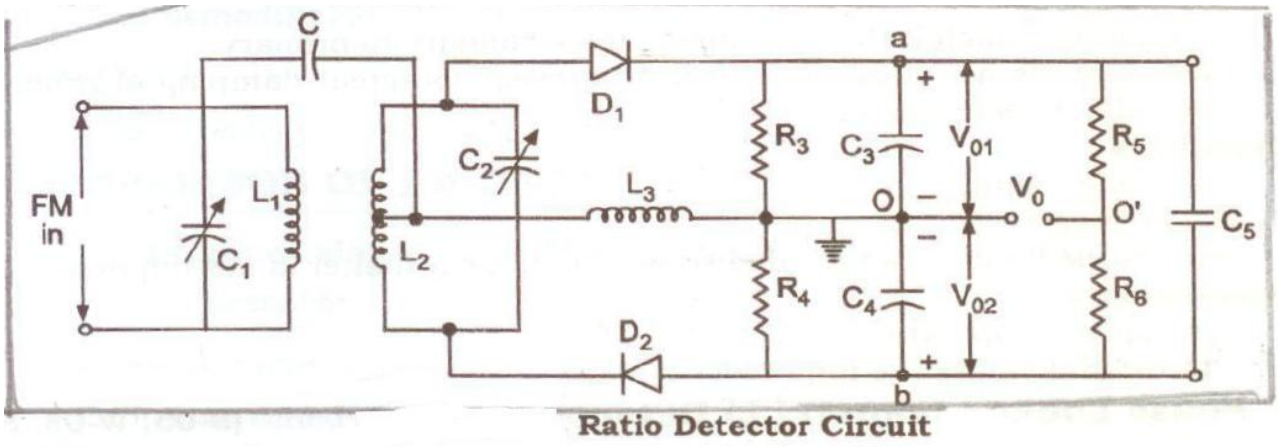


Block Diagram of FM Receiver- (FM Radio Frequency Range **88 MHz-108** MHz).
As shown in block diagram of FM receiver functions of each block are:
RF Amplifier :In domestic AM receivers, RF amplifier is not used but in FM receivers, FM amplifiers are used. Its function is -
1. To improve signal to noise ratio.
2. To match the receiver input impedance to antenna impedance.
3. To reduce noise figure.

Mixer: It is also known as frequency changer.
Input signal frequency fs and local oscillator frequency f0 are mixed down to convert received signal to intermediate frequency (IF).
IF = f0 - fs
IF = 10.7 MHz for FM ranges from 88 MHz to 108 MHz.
IF Amplifiers: It amplifies the IF of mixer output. Due to large bandwidth gain per stage is low. Therefore, two or more stages of IF amplifier are used.
Amplitude Limiter: It removes the unwanted amplitude that is added in original FM signal while travelling in free space. It is removed before demodulation, otherwise distortion appears at output.
FM Detector: Converts the FM signal into original modulating signal.
De-emphasis: The artificially boosted high frequencies at transmitter are removed by de-emphasis.
AF and Power Amplifier: First the modulating signal is voltage amplified and its power is increased to drive the loudspeaker.
AGC: Automatic gain control is used to ensure that the signal fed to the limiter is within its limiting range and also prevents overloading of last IF amplifier.
Loudspeaker: Converts modulating signal into sound information.

d) State the use of limiter stage .Give reason why limiter stage is not used before ratio detector?
Ans:- Amplitude limiter- It removes the unwanted amplitude that is added in original FM signal while travelling in free space due to noise effect and other interferences. It is removed before demodulation, otherwise distortion appears at output.
(2 mks)

The ratio detector has a capacitor in the circuit which acts as amplitude limiter itself, so limiter stage is not used before ratio detector as shown below .
(1 mks)



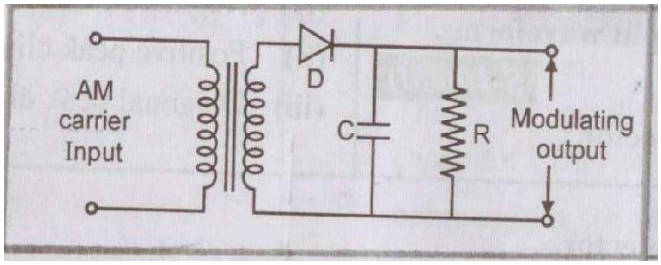
Ratio Detector Circuit (1 mks)

e) Explain the working of simple diode detector with diagram.

Ans:- An envelope or simple diode detector is a electronic circuit that takes a high frequency signal as input and provides an output which is the envelop of the original modulating signal.

The diode is a rectifier diode and works in the linear region of VI characteristics graph. It is made to conduct in the positive half cycle and remains off in the negative half cycle .Thus output contains original modulating voltage and the carrier frequency voltage. The high frequency carrier is filtered out by the RC network. Thus the desired modulating signal is obtained across resistor R.

(2 mks)



(2 mks)

f) What is interlaced scanning in TV? Explain in brief.

Ans:- In TV transmission Interlace scanning is used . In interlaced scanning the total number of lines are divided into two groups called ‘field’. Each field is scanned alternately , this method is called Interlaced scanning. In this process in which the first 3125 odd numbered lines are scanned and then 312.5 even numbered lines are scanned. So that frame containing 625 line is scanned twice . This type of scanning are used in the flicker effect is eliminated without increasing the speed of scanning does not need any increase in channel bandwidth . the complete processes of standard interlaced scanning pattern is shown in diagram.

It has two fields. ODD and EVEN

ODD Fields:- In odd field 292.5 lines are active lines and 20 lines are in active lines . Active lines give the information about the picture signal and inactive line does not gives the information about the picture signal.

EVEN Field:- In even field 292.5 lines are active lines and 20 lines are in active lines . Active lines give the information about the picture signal and inactive line does not gives the information about the picture signal. The total lines in one frame or picture are 625 lines . In interlace scanning.

Total active lines :-

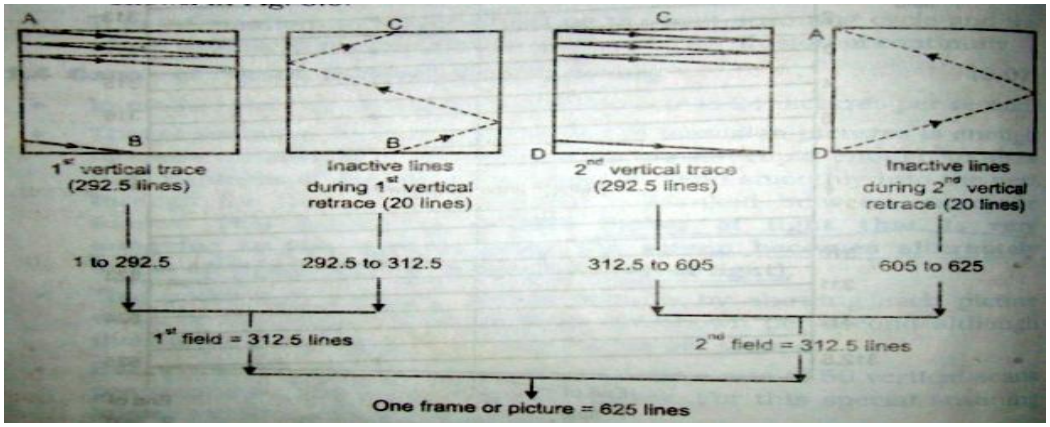
Odd field = 292.5

EVEN Field = 292.5

Therefore total actives lines = 595.0

Total inactive lines = 40

Therefore total scanning lines in one frame or picture is 625 lines. (2 mks)



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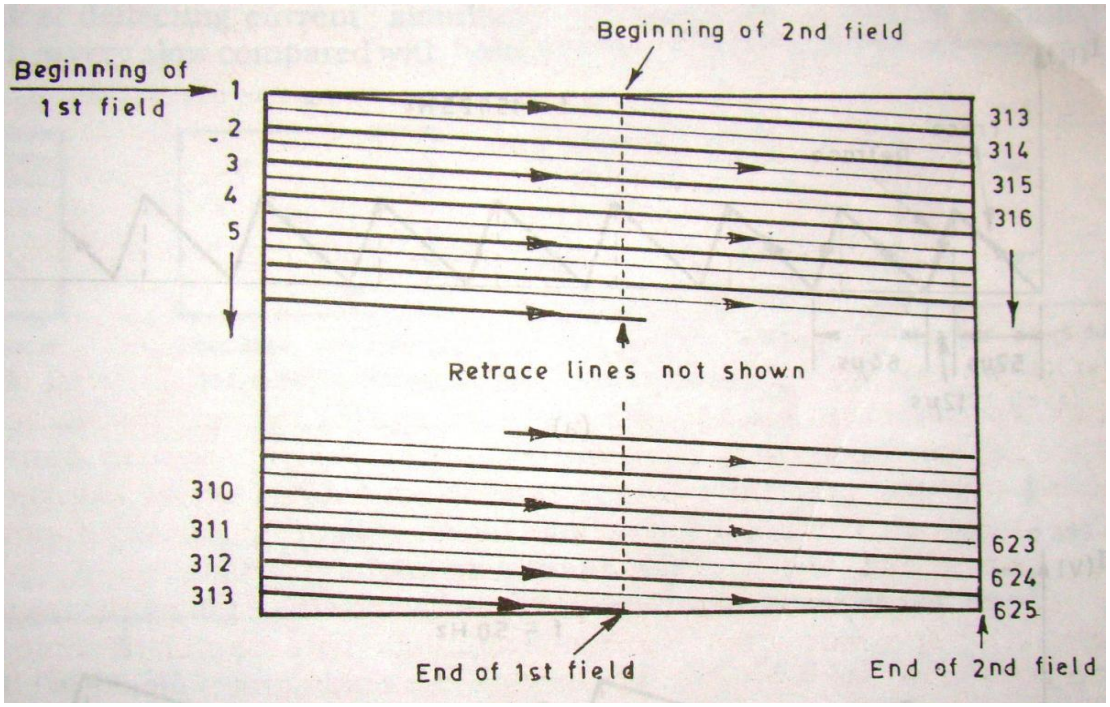
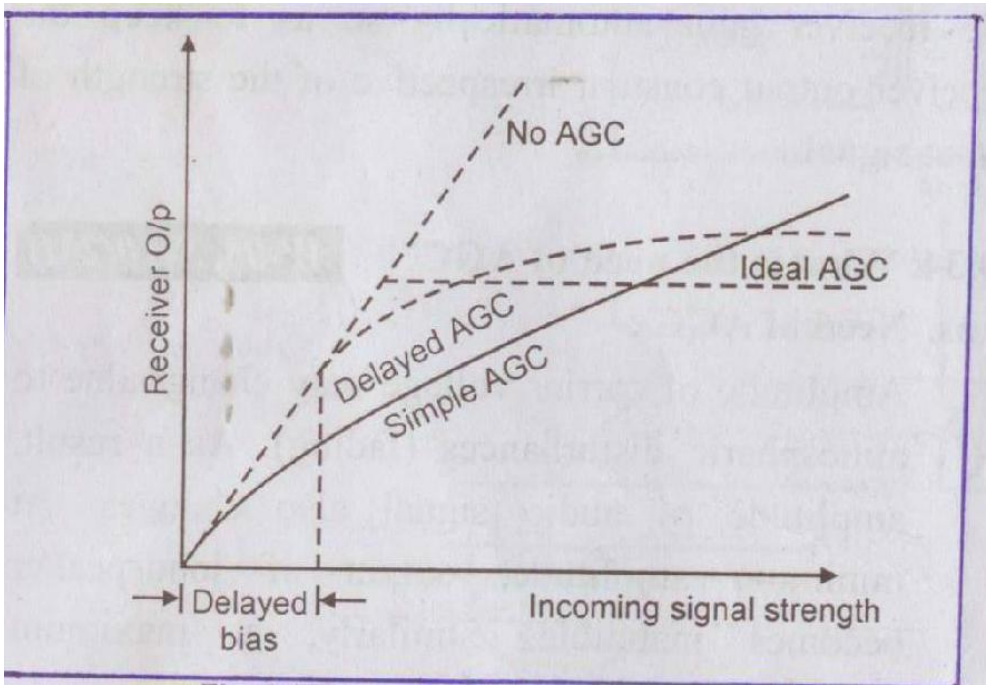


(2 mks)

5. Attempt any FOUR of the following 16

a) Draw and explain AGC characteristics for delayed and simple AGC.

Ans:-(2 mks diagram, 2 mks explanation)



Simple AGC- It reduces the receiver gain in proportion to the incoming signal strength. As the result of this arrangement receiver gain is reduced for weak signals. This is undesirable.
Delayed AGC-Here the operation of AGC circuit is delayed to the extent of delayed bias applied. This keeps the circuit inoperative for weak signals.When the strength of the weak signal exceeds, the delayed bias AGC circuit becomes operative and smoothens the output of the signal.Delayed AGC can be made close to the ideal AGC by control of delayed bias.

b) What are the advantages and disadvantages of balanced slope detector.
Ans:-Advantages (2 points 2 mks)
1)It is more efficient
2) Its linearity is better than single slope detector

Disadvantages(2 points, 2 mks)
1)Tricker to allign
2) Amplitude limiting is not provided

c) Define
Ans:- (1 mk each)

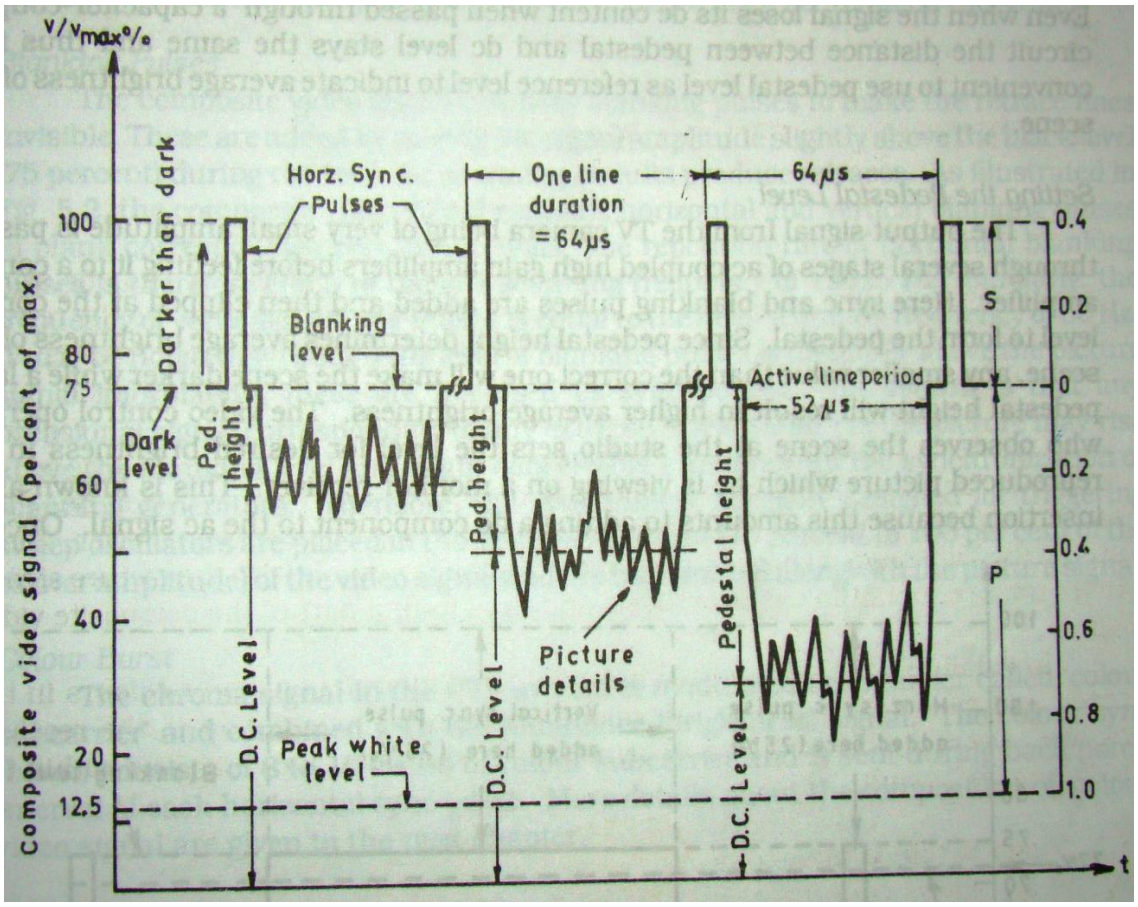
1) HUE -The colour itself is called 'hue' and dependent on the dominant wavelength of the light. By adding two or more of the primary colours, many hues are produced .

2) Saturation- It represents the purity of colour. It is the amount of white light mixed with colour. A full saturated colour will have no white light present in it.

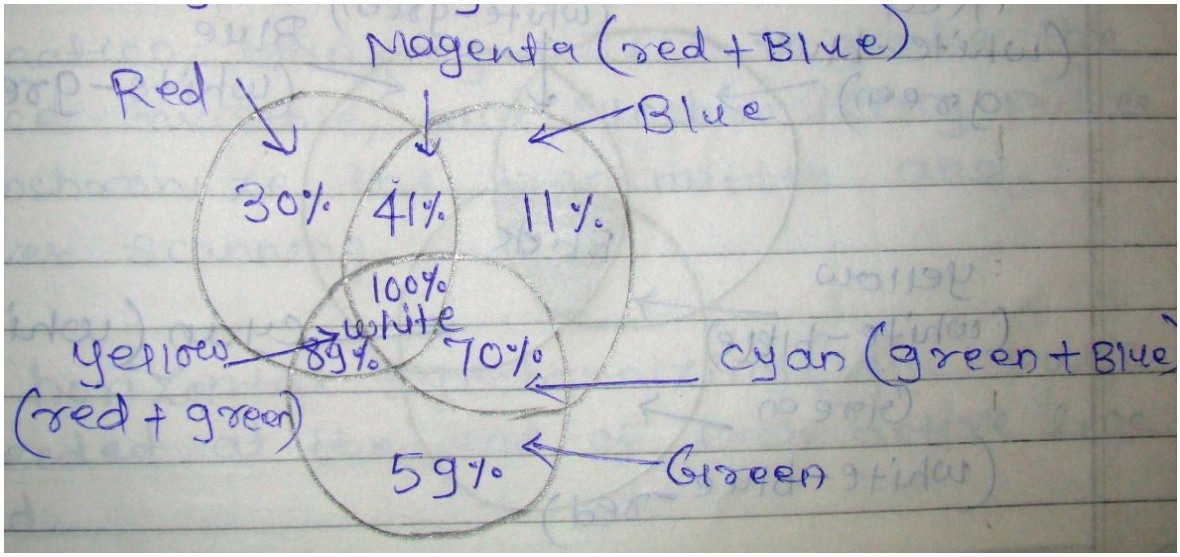
3) Contrast-The difference in the intensity between black and white parts of the reproduced picture is known as contrast.

4) Viewing distance with respect to TV-It is defined as the distance between screen of TV receiver and viewers eye.It varies between 3 to 8 times the picture height and varies from person to person.

d) Draw composite video signal and label it.
Ans:- (proper diagram and label 4 mks)



e) Describe additive colour mixing with circle diagram.
Ans:- (Circle diagram 2 mks, explanation 2 mks)



Explanation-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.

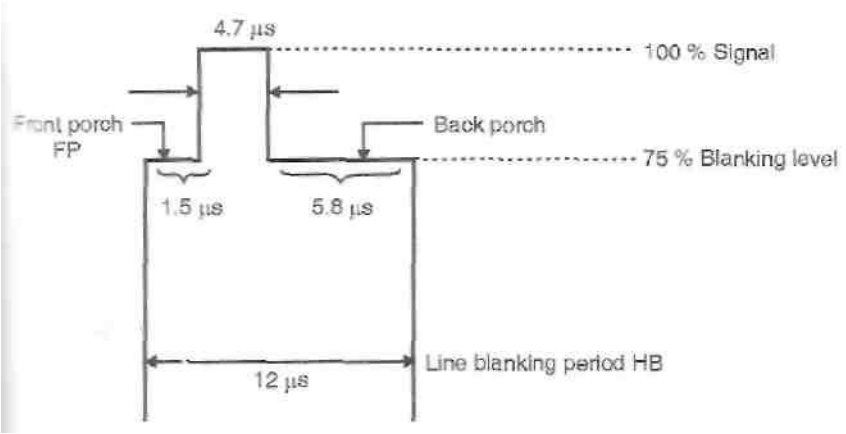
f) List any eight CCIRB TV standards.
Ans:- (any 8 points ,4 mks)

Parameters	CCIR B standard
1. Number of scanning lines/frame	625
2. Field (vertical) frequency	50Hz
3. Line(horizontal) frequency	15625Hz
4. Aspect ratio(width/height)	4:3
5. Horizontal trace time	52μs
6. Horizontal retrace time	12μs
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
1 8.Sync pulse top	100%
19.Blanking/pedestal level	75%
20.Black level	72-75%

6. Attempt any FOUR of the following. 16

a) Draw and explain horizontal blanking pulse and state the function of horizontal sync pulse , front porch and backporch.

Ans:-



(1 mks)

Horizontal/Line sync pulse : This pulse is perched on top of the blanking pulse. It is sent from the transmitter to correct the horizontal scanning rate at the receiver if it deviates from its assigned rate. Its width is 0.075 H = 4.7 us. (1 mks)

Front porch : The horizontal sync pulse that starts the horizontal retrace begins at 1.5 us, after the start of the horizontal blanking pulse. This portion is known as front porch. This delay in the start of the sync pulse ensures that the end of each line is blanked out before the retrace begins. The front porch blanking interval produces a vertical black bar at the right hand edge of the picture that is off the viewing portion of the screen. (1mks)

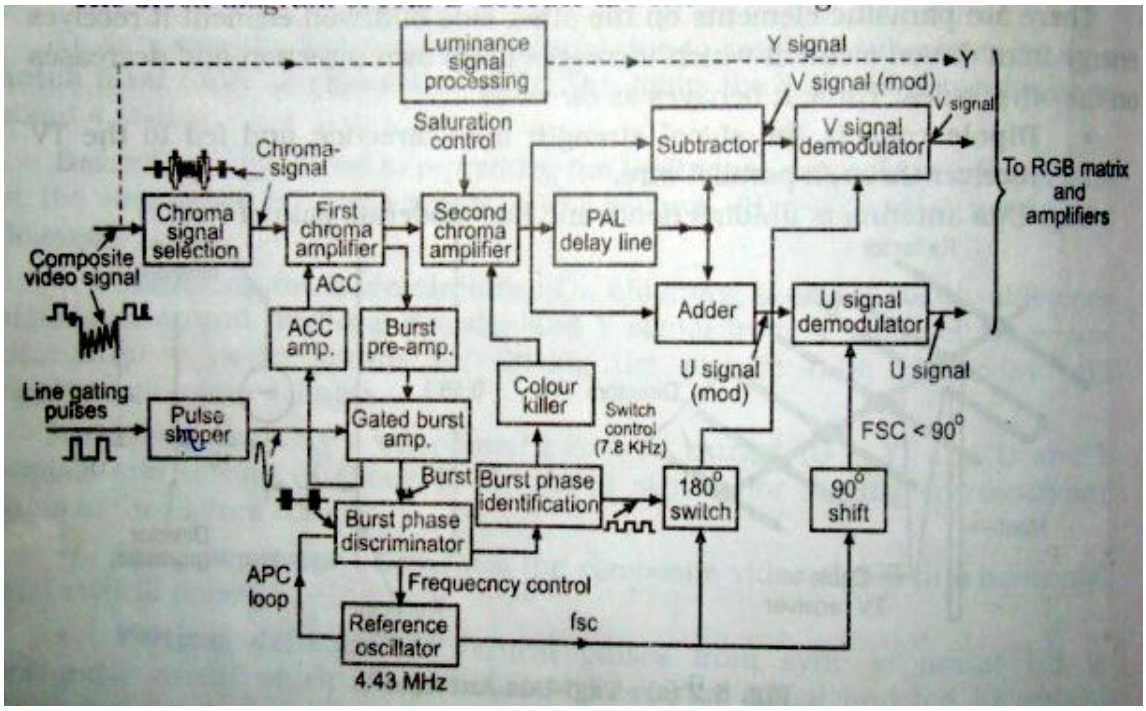
Back porch : The back porch exists, following the completion of the horizontal sync pulse. The back porch is of 3.8 us . This period allows the line flyback to be completed and settled from oscillatory conditions in the deflection circuits, before the next deflection starts. (1mks)

b) Compare vidicon and plumbicon camera tubes.

Ans:- (any 4 points 4 mks)

Parameters	Vidicon	Plumbicon
Resolution	High	Low
Size	Small size and compact	Medium size and compact
Sensitivity	Poor/Low	High
Dark current	High dark current	Low

c) Draw and explain blockm diagram of PAL D decoder.
Ans:- (Block diagram 2 mks, explanation 2 mks)



Explanation-

Chroma Signal selection:- Select the chrominance signal and reject all other unwanted components of composite signal.

Colour killer circuit:- As the name suggest that this circuit becomes 'ON' and disables the chroma amplifier during monochrome reception. Thus it prevents coloured interference on the screen.

Sync demodulator: - The o/p from adder and subtractor consist of two independent RF signals such as (U and V). They yield an accurate and constant no-colour difference signal voltage varies.

Colour difference amplifier and matrixing:- Three colour difference signal amplified and fed to appropriate grids of the picture tube matrix is designed to produce (R-Y)(G-Y)(B-Y) signal from I and signal .

Burst gate amplifier:-To separate the colour burst from the chrominance signal

Reference oscillator:- Generates exactly right frequency with same phase reference as the original subcarrier.

ACC amplifier:- A second o/p from the gate burst amplifier is connected to a dc voltage by rectifier circuit and then fed to the ACC amplifier.

PAL delay lines:- Averaging and separates U and V modulating signal

V signal demodulator:- Produces V colour difference signal.

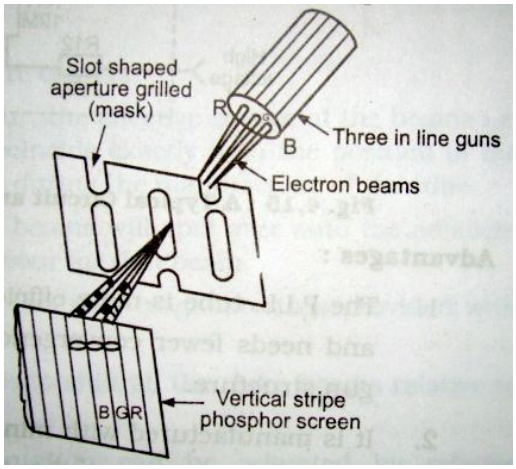
U signal demodulator :- Produces U colour difference signal.

d) Write any four applications of CCTV system.

Ans:-

1) It is very useful in banks ATM centres and shops.
2) It is used for surveillance in college campus and industry.
3) It is used for traffic control as well as crowd control.
4) also used for medical care and safety.

e) Explain working principle of PIL picture tube.
Ans:- (Diagram 2 mks, explanation 2 mks)

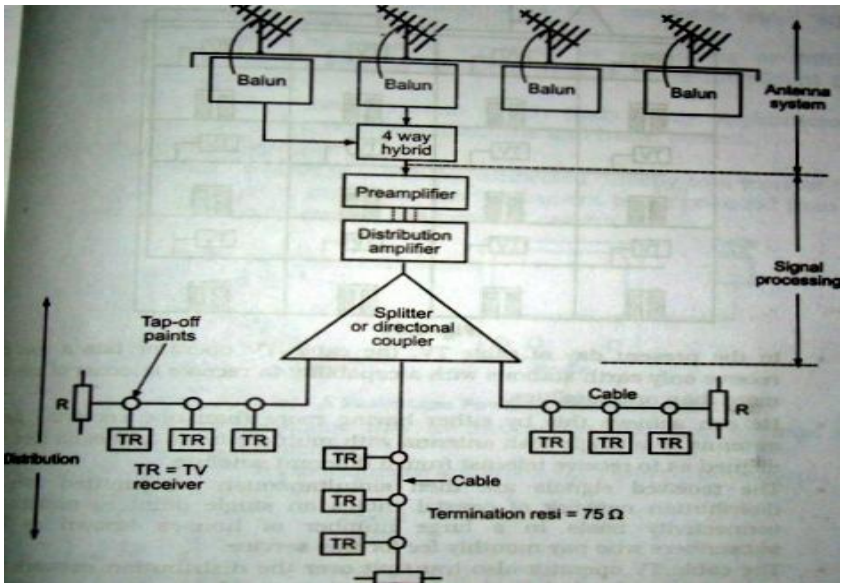


Explain: It is precision in line picture tube.3 guns (RGB) aligned precisely in a horizontal line.It helps in

simplifying coverage adjustment.Aperture mask has vertical slots correspond to colour phosphor strips.

Since all 3 e^- beams are on some plane beam moves along axis of tube.The slots in mask are so designed that each beam strikes its own phosphor and prevented from landing on other phosphor.

f) Explain MATV with block diagram.
Ans:- (Diagram 2 mks, explanation 2 mks)



Explanation: Numbers of antennas are located on roof top, depending on direction of telecast. Antennas are placed such that all stations are received simultaneously. Antenna o/p is fed into 4 way hybrid. O/p is fed to distribution amplifier amplifies the level to prevent losses. O/p is fed to splitters through coaxial line. The o/p of splitters is convey to the pt. of delivery via coaxial line.