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.

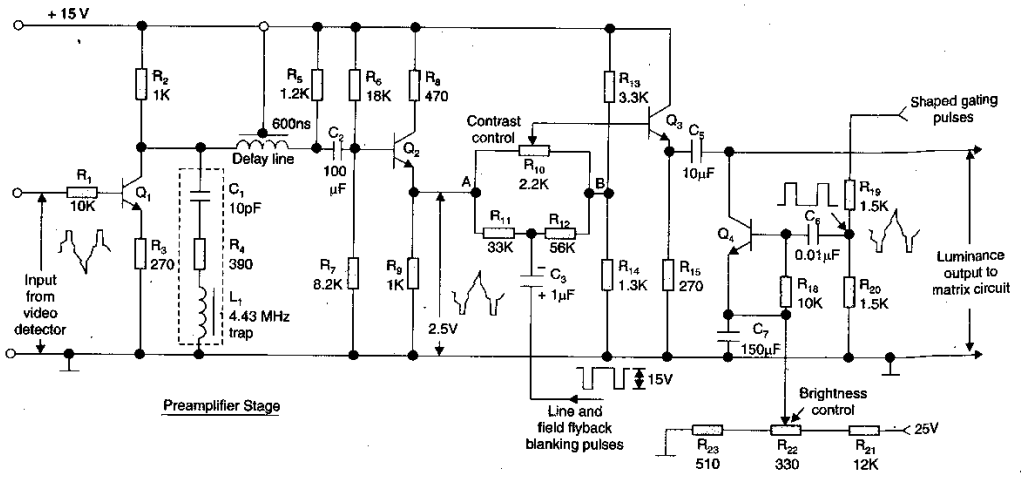
Q1.

A) Answer any three: **12M**

a) Explain the working of Luminance signal processing with circuit diagram.

Ans:-

Circuit diagram:- **02M**



Working: **02M**

- Transistor Q1 constitutes the preamplifier and it designated to provide impedance match to the delay line on its output side and video detector on the input side.
- The amplified and inverted signal that becomes available at the collector of Q1 is fed via delay line at the base of Q2. The in between series trap formed by C1, R4 and L1 is to bypass Chroma signal.
- The contrast control elements R10, R11 and R12 form a part of a bridge circuit where potentials at point A and B are at the same level. The dc voltage at point A is nearly 3V and therefore values of R13 and R14 are so chosen that voltage at point B is also equal to 3 volts.
- The clamping voltages are applied directly to the emitter of Q4 which is connected to operate as an electronic switch. During picture content periods of the Y signal, the transistor is held in non-conducting

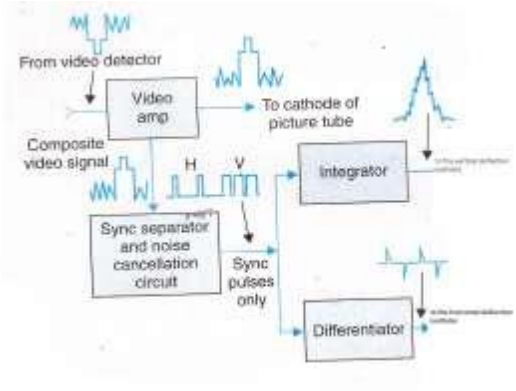
state by resistor R18 connected between base and emitter.

- During back porch intervals of the video signal, Q4 is momentarily forced into full conduction by the arrival of positive going line frequency rate pulses applied to its base via capacitor C6.
- The amplified video (luminance) signal obtained at the output of luminance channel is either passed on to a suitable stage in the Chroma IC or to the discrete R,G &B output stage.

b) Draw neat circuit diagram of sync separator and explain its working.

Ans:-

Circuit diagram:- **02M**



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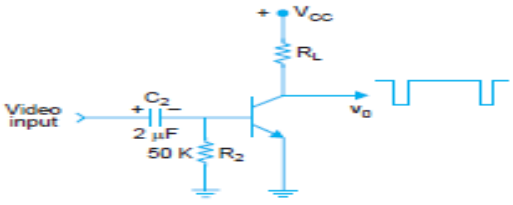
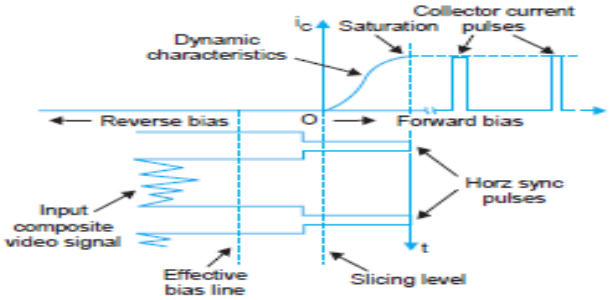


Fig. 16.2 (b). Basic sync separator circuit employing a transistor.



Explanation:- **02M**

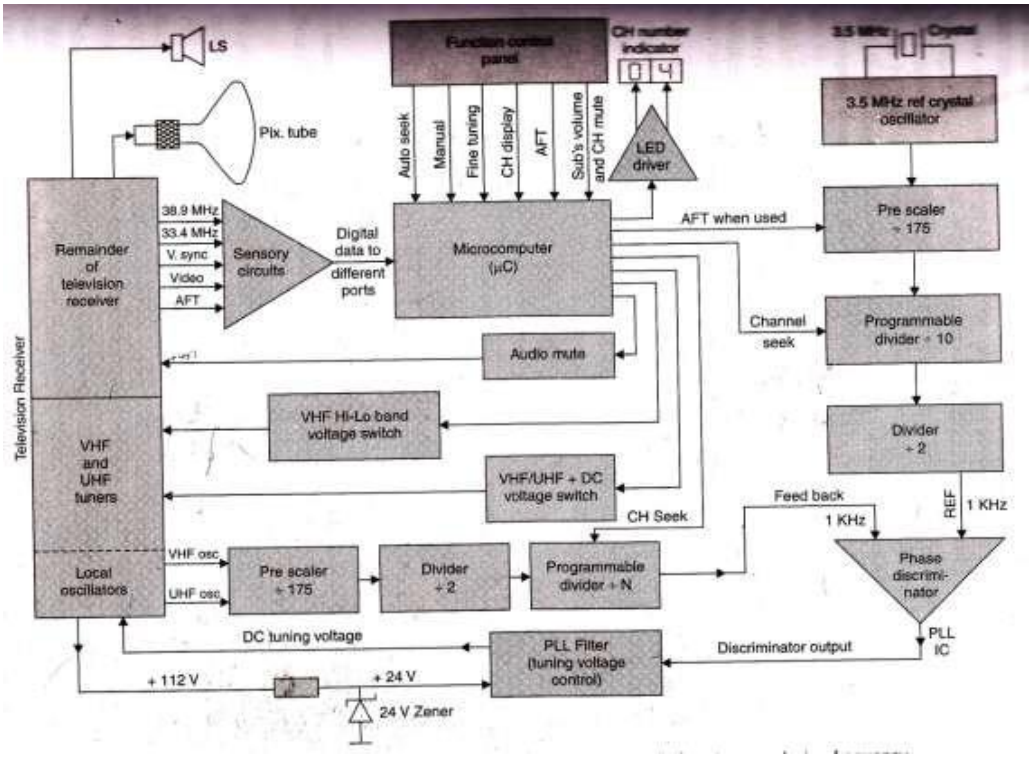
- The sync pulses include horizontal, vertical and equalizing pulses. There are separated from the video signal by the sync separator.
- The clipped line (horizontal) and field (vertical) pulses are processed by appropriate line-pulse and field –pulse circuitry. The sync output thus obtained is fed to the horizontal and vertical deflection oscillators to the time the scanning frequencies.
- As a result, picture information is in correct position on the raster.
- The sequence of the operation is illustrated in figure.
- The problem of taking off the sync pulses from the video waveform is a comparatively simple one, since the action consists of merely biasing the device use in the circuit, in such a way, that only the top potions of the video signal cause current flow in the device.

- This is readily achieved by self-biasing the tube or transistor use in the circuit.

c) Draw neat block diagram of microcontroller based TV system

Ans:-

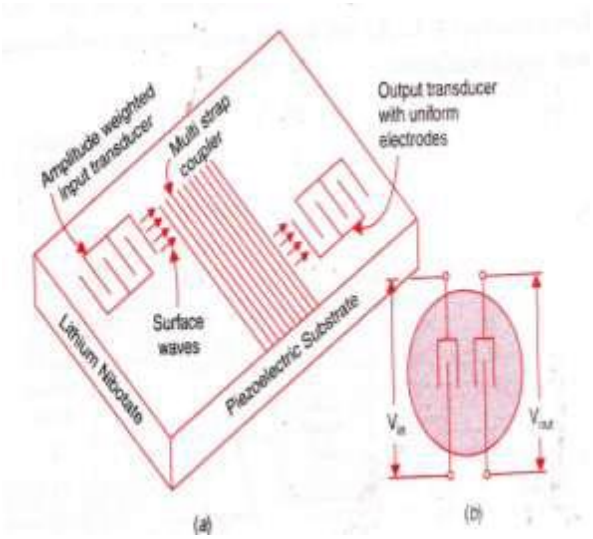
Block Diagram:- **04M**



d) With neat sketch, explain construction of SAW filter.

Ans:-

Construction of SAW filter:- **02M**



Explanation:- **02M**

- The SAW filter uses two crystal, which have piezo-electric properties. When a varying electrical signal is applied across two surface of such a crystal, mechanical vibration are produced across the other opposite set of faces and vice versa. This characteristic has been made use of in the SAW filter.
- The transducing crystal is cut into segments, called fingers. All fingers are of the same length in the input transducer. Equal length of the fingers make it a broad band transducer

Q1

B) Attempt any one: **06M**

a) Draw circuit diagram of ident signal amplifier and colour killer. Explain its working.

Ans:-

Diagram :- **03M**

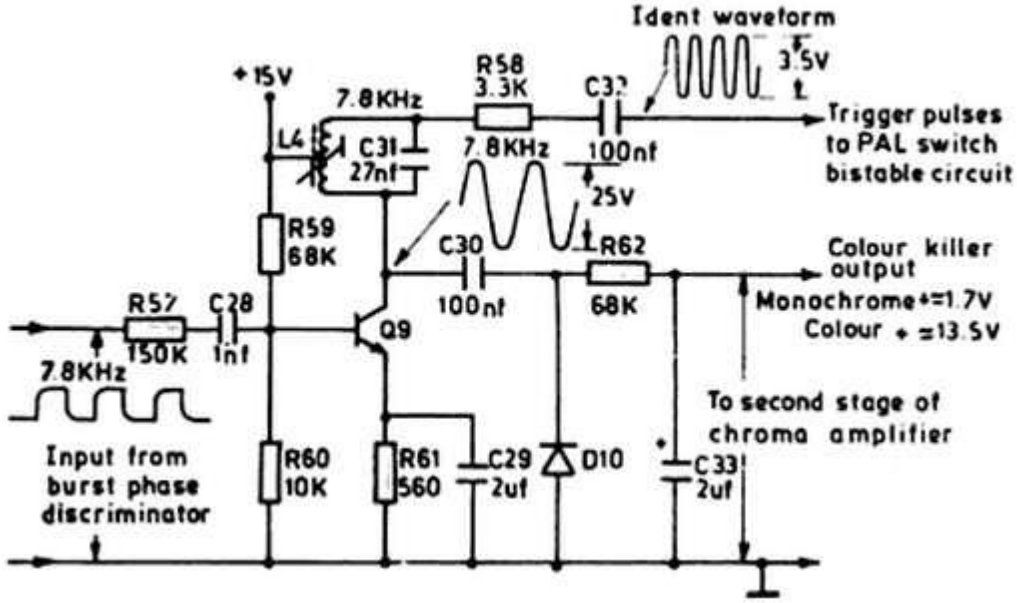


Figure: Burst phase IDENT amplifier & color –Killer generation circuit.

Explanation:- **03M**

- The dc operating voltage to Q9 is supplied via center tap on L4. Such a connection causes L4 to
- function as a tuned autotransformer & enables a waveform of about 25V peak-to-peak to be
- developed at the collector of Q9.
- This is fed via C30 to diode D10 which functions as a HWR. The components R62 & c33 form a LPF
- which provides a steady dc level of about 13.5V as the output. This is the color killer voltage which is
- used to control conduction of the second stage of Chroma signal amplifier.
- When a black and white picture is being received, there is no output from the burst discriminator &
- hence, no input to burst phase indent amplifier.
- Under this condition the color killer output fails to less than 2V which is not enough to forward bias
- transistor of the Chroma amplifier. Thus the second Chroma amplifier stage is inhibited.
- This prevents application of any signal to the Chroma delay line & to the U & V demodulators. Thus

- any stray coloring signals are prevented from reaching RGB amplifier & hence, no colour noise appears on the black & white picture during monochrome receptions.

b) Explain auto stereoscopic method of 3 DTV. Write its one advantage. List different methods of auto stereoscopic.

Ans:-

Methods:- **½ M each**

- Lenticular method
- Parallax method
- Holographic method

Advantage:- **01M**

- No need to were glasses to observe 3 D picture

Auto stereoscopic Method in 3DTV:- **(Explanation of any one method)** **3 ½ M**

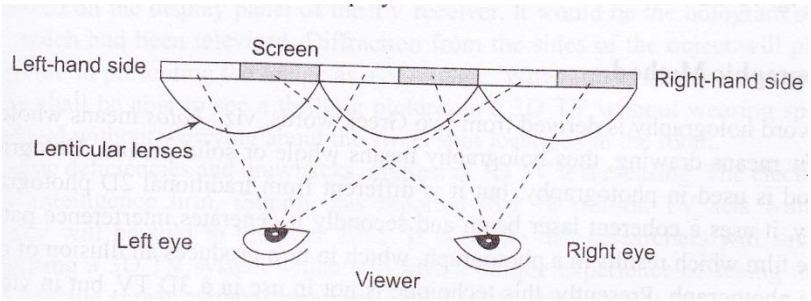
Auto stereoscopic is a method of displaying stereoscopic images (adding binocular perception of 3D depth) without the use of glasses on the part of the viewer, it is also called "glasses-free 3D" or "glasses-less 3D" system

Explanation:-

Note: Any one method is to be considered

i) Lenticular Method:-

Diagram:-

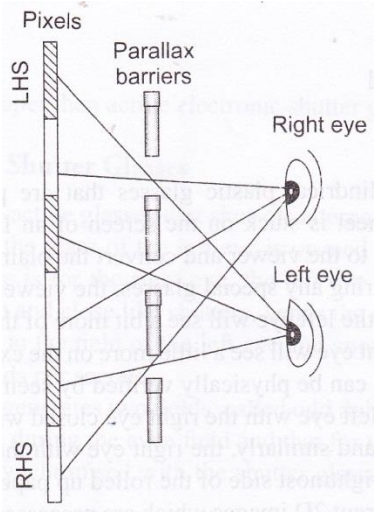


- Lenticular lenses are cylindrical plastic glasses that are pasted in an array on a transparent sheet.
- Thus sheet is struck on the screen of an LCD TV. The cylindrical lenses magnify the image to the viewer and convert the plain image into a cylindrical image.
- Now, without wearing any special glasses, the viewer's two eyes will see two slightly different images. The left eye will see a bit more of the display on the extreme left hand side, and the right eye will see a little more on the extreme right – hand side as shown in fig.
- This method gives a good quality 3D view of the image, the view is greatly dependent on the position when the viewer is sitting.

OR

ii) Parallax Barrier:-

Diagram:-

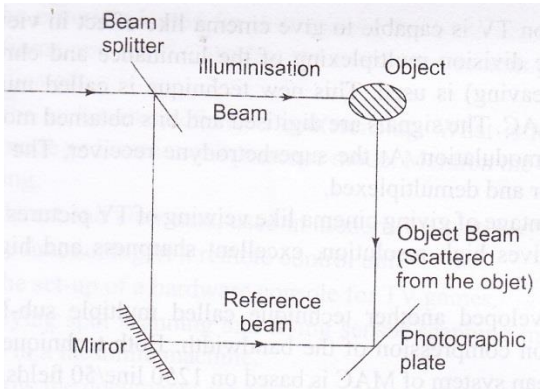


- The Parallax barrier is a fine grating of liquid crystal with slits in it. When placed over a screen, the slits corresponds to certain column of pixels on the TV's screen.
- When a small voltage is applied to the parallax barrier, the slitted grating allows two slightly different images to reach the left and the right eye, as shown in the fig. the brain processes these two images to produce 3D images.
- The parallax barrier can be switched on and off easily, allowing the TV to be used as a traditional 2D or A new 3D set. While it offers good quality contents, it is sensitive to the position of the viewer, resulting in well-defined sweet spot . This aspect hampers its general acceptability.

OR

iii) Holographic Method:-

Diagram:-



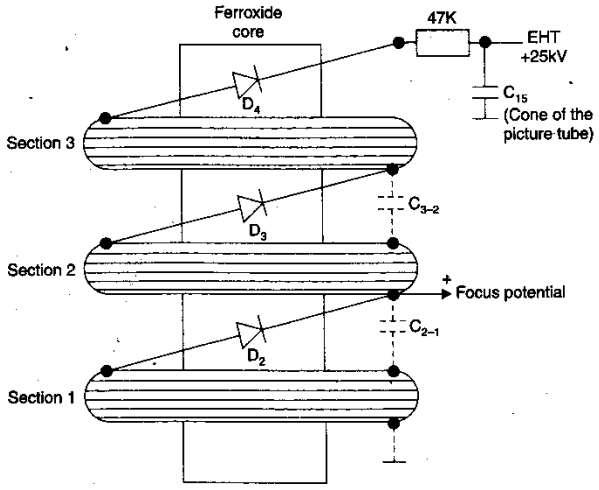
- A laser beam from a suitable source, say an LED is split into two beams by a prism or a special mirror one beam goes to the object and is scattered from innumerable points of the object and reaches the film.
- The other beam from the splitter goes directly to the film without encountering the object. This is called "reference beam."
- As all the points of the object are not equidistant from the film, the scattered beam coming from non-equidistant point will have phase difference with respect to the reference beam from some point it would be in phase while from some other points out of phase.
- The phase, and weakening when they meet in an opposite phase. The interference pattern so obtained will produce the effect of depth. This is how holograms are prepared
- In case of TV, a 3D image will be registered on the surface of the target plate of the TV Camera by using holographic techniques.
- When this image is transmitted and reproduced on the display panel of the Tv receiver, it would be the hologram of the scene which this image is transmitted and reproduced on the display panel of the TV receiver, it would be the hologram of the scene which had been televised

Q2 Answer any four: **16M**

a) Explain the generation of EHT using diode split technique

Ans:-

Diagram:- **02M**



Explanation:- **02M**

- The Diode split technique is three layer secondary windings are shown wound round the ferroxide core of the L.O.T While the three section are shown separately, in actual practice these are wound one above the other and are thus concentric. Each winding is identical to the other and has the same number of

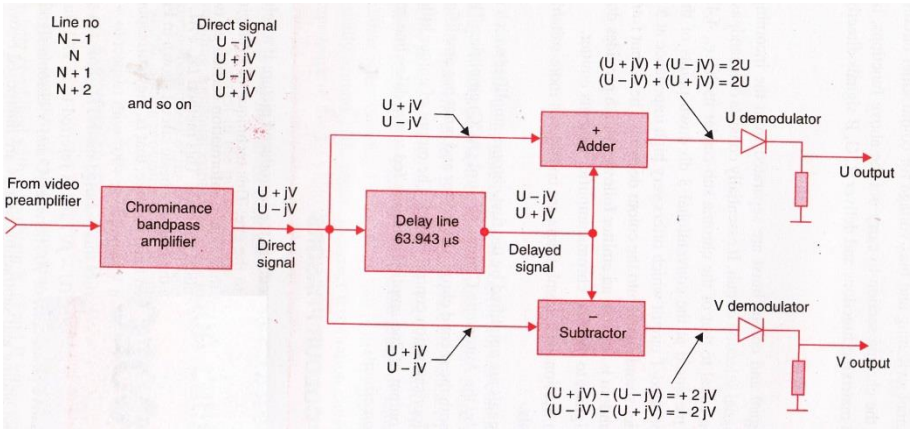
turns. The same magnitude of voltage will therefore be induces in each section every time the flyback derived input pulse gets applied to the primary winding .

- Because of the close proximity of individual layers, an inter-layer capacitance exists between each of them. It is indicated in the diagram by capacitors in dotted – chain form because these are no physical capacitors. If a diode is connected between the end of the layer of winding and the start of the next, the ac voltages induced in each layer can be made to charge up all the inter-layer capacitances to the same voltage. Since the capacitances are effectively in series, the total voltage, appearing at the output terminal is the sum of all the voltages appearing across all of them. The diodes shown connected in series between the layers are physically embedded in the winding and form an integral part of the transformer.
- The three winding are so designed that voltage induced in each layer form the flyback transformer in 8.33KV. This makes the total potential equal to 25KV and forms the EHT supply source. IN some designs, four layers of windings are used and each layer provides a voltage equal to 6.8KV

b) With the help of block diagram; explain the generation of U and V signal in TV receiver

Ans:-

Block diagram:- **02M**



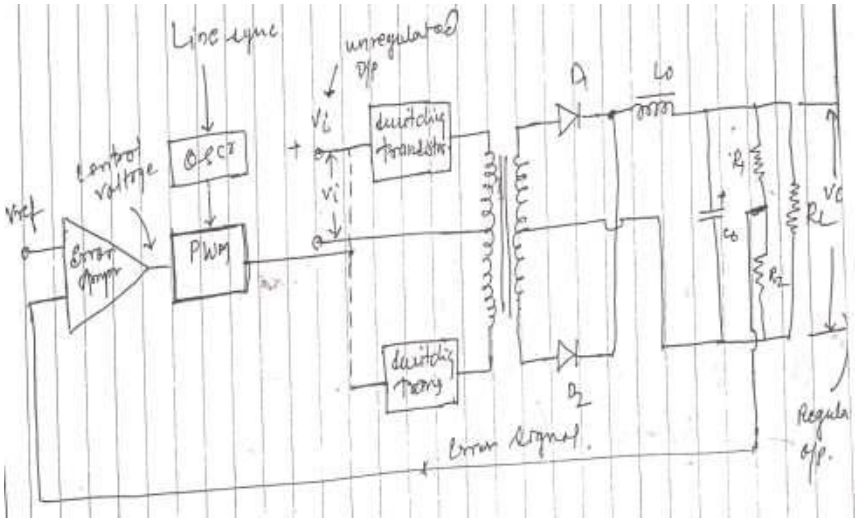
Explanation:- **02M**

- A delay line and adding and subtracting circuits are interposed between the chrominance amplifier and demodulators.
- The object of delay line is to delay the chrominance signal by almost one line period of 64us.
- The chrominance amplifier feeds the chrominance signal to the adder, the subtracter and the delay line.
- The delay line in turn feeds its output to both the adder and subtracter circuit.
- The adder and the subtracter circuits, therefore, receive the two signals simultaneously. These may be referred to any given time as the direct line and delay line signals.
- The adder yields a signal consisting of U information only but with twice amplitude (2U)
- Similarly , the subtraction circuit produces a signal consisting only of V information, with an amplitude twice that of the ‘V’ modulation product.

c) Describe the working of push pull SMPS with the help of block diagram

Ans:-

Block diagram:- **02M**



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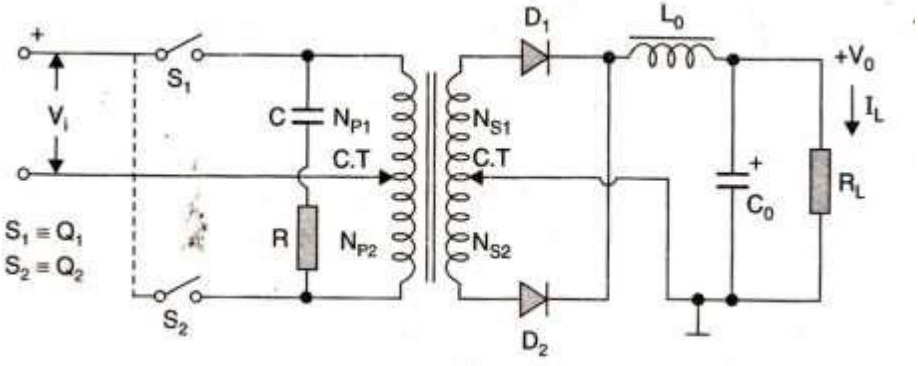


Explanation: **02M**

- Switches S1 and S2 represents two transistors that are necessary for transfer of energy from unregulated source Vi to the load circuit. The two transistor conduct alternately by opposite polarity pulses from the pulse width modulator.
- Thus D1 and D2 conduct alternately as in a conventional full-wave rectifier circuit.
- The choke L_0 and filter capacitor C_0 store energy to maintain steady voltage across the load.
- The feedback circuit operates in the same manner to actuate the PWM in such a way that conduction periods of switching transistors vary in accordance with variation in load current thus maintains output voltage constant at V_0.

d) List advantages and disadvantages of remote control system.

Ans:-

Advantage:- (any two) **02M**

- Audio muting option is available.
- TV can be programmed by remote control system.
- User can make their own set of selected channels**.**

Disadvantage :- (any two) **02M**

- It requires line of site.
- Range of IR sensor is less compared to any other wireless communication components.
- Latest Tv do not have power on/OFF button on the Tv so if remote is faulty Tv cannot be stay off condition means it goes in standby mode which ultimately cause loss of power.

e) List characteristics and features of Plasma TV

Ans:-

Characteristic and Features of plasma TV: (any four) **01M each**

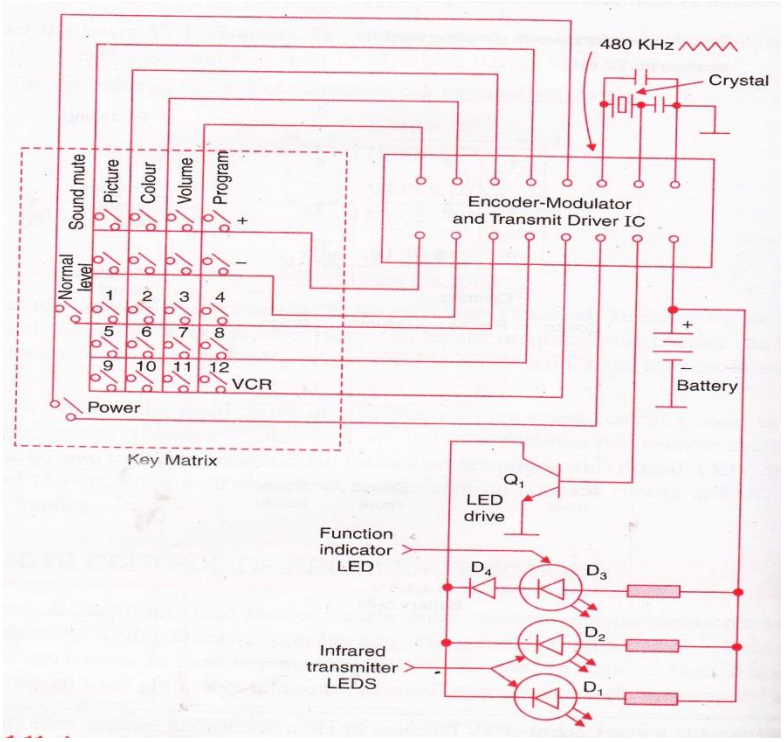
- There is no flicker as all the phosphor excited pixels react at the same time during one frame of scanning.
- There is also no back light and no protection of any kind.
- As , such the light emitting phosphors result in bright pictures with rich colors and wide viewing angle.
- Though plasma screens are thin, they are heavy and consume lot of power.
- These are also fragile and often need professional help to install them.
- Capable of producing deeper blacks allowing for superior contrast ratio.
- Wider viewing angles than those of LCD.
- Less visible motion blur.
- Superior uniformity.
- Unaffected by clouding from the polishing process.
- Less expensive for the buyer per square inch than LCD

f) Draw the block diagram of Remote Control Transmitter and Receiver unit and explain its functioning.

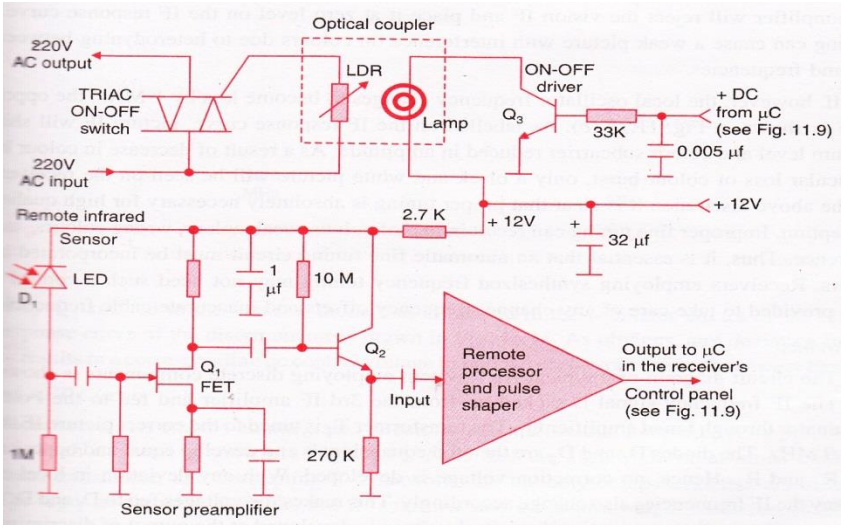
Ans:-

Block diagram:-

Transmitter **1 ½M**



Receiver:- **1½ M**



Explanation:- **01M**

The pulse output (high or low) on depression of any one key button activates special individual circuitry in the encoder. It produces a distinctive pulse train which modulates the crystal controlled 48 KHz carrier. After due amplification it is fed to the LED driver which passes proportionate current pulses through the two LEDS, D_1 and D_2,. The emission of radiation in the infrared region causes transmission of the modulated wave towards the remote controlled receiver when the unit is aimed at it. In addition, the modulated 48 KHz output from Q_1 is rectified by D_4 and lights the function indicator LED(D_3) located on right hand top of the transmitter panel. This LED shows that a function button has been depressed. If it fails to light, it indicate that the battery needs replacement.

A Schematic diagram of the remote control receiver is shown in fig. The pulse modulated infrared signals from the remote infrared transmitter are picked up by the remote infrared sensor D_1. The picked up ac signal feeds into Q_1,an FET amplifier, for some amplification. It is then coupled to the remote processor and pulse shaper via emitter follower Q_2. The modulated signals are further amplified and then demodulated. The recovered pulse train then feeds into the pulse shaper which is designed to generate pulse patterns (ramps, high, low etc.). Each pattern is different and corresponds to the function button pressed on the remote control unit. The shaped individual pulse pattern is then dc coupled to the microcomputer. The microcontroller on receipt of different inputs produces appropriate output to perform the ordered functions.

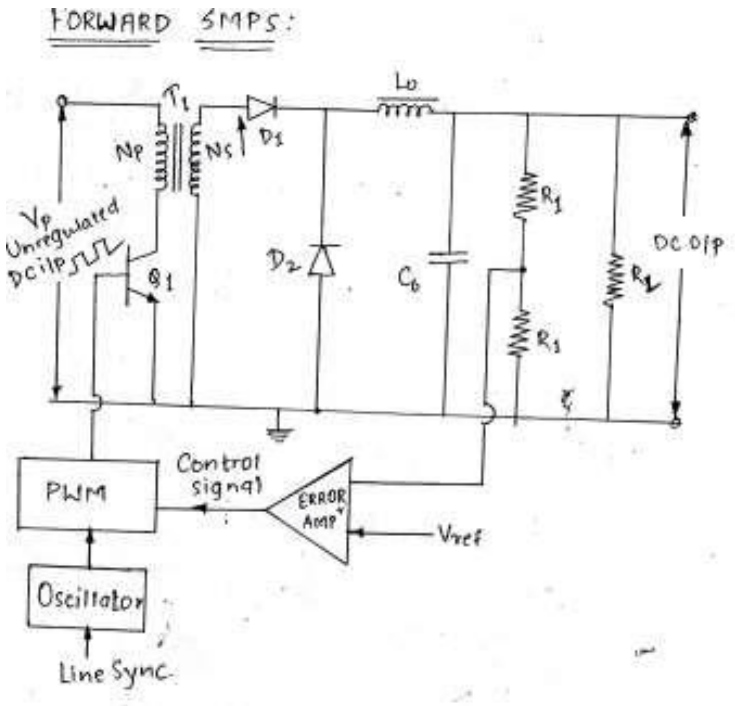
Q.3 Attempt any four: **16M**

(a) Draw circuit of forward SMPS and explain its working.

Ans:-

Note:- Any other relevant diagram can be considered

Circuit diagram: **02M**



Operation: **02M**

- Unregulated DC input voltage is taken from main supply by simple diode rectifier and connected to the series circuit of primary winding of Transformer T1 and switching transistor Q1.
- The conduction of Q1 is controlled by varying width of pulse fed at its base from a pulse width modulation (PWM).
- PWM is driven by error amplifier and oscillator.

- The oscillator generates a rectangular pulse of constant duration & amplifier whose frequency is synchronized to the horizontal oscillator.
- The error amplifier controls the pulse width of pulse width modulation by applying controlled voltage .It compares reference voltage and error signal obtained from resistor voltage divider of R1,R2 to generate the control signal.
- When the transistor Q1 is ON. Input voltage is applied to the primary winding of transformer T1or rising current in Np produce polarity voltage. At the upper end Ns.
- Thus, diode D1 conducts during ON period of transistor Q1 to store energy in L0 & C0 & also feed load current . Diode D2 stays reverse biased during this interval.
- As soon as transistor Q1 turns 'OFF' the decreasing currents in Np induces a voltage across ns i.e of opposite polarity.
- Diode D1 is thus reverse biased & no transfer of energy to the load circuit takes place.
- However, the energy stored in L0 and C0 is transferred to the node circuit
- Since the diode D1 conducts & store energy when Q1 is on , its is called as forward SMPS.

(b) Explain the role of microcontroller in TV receiver.

Ans:-

Explanation: **04M**

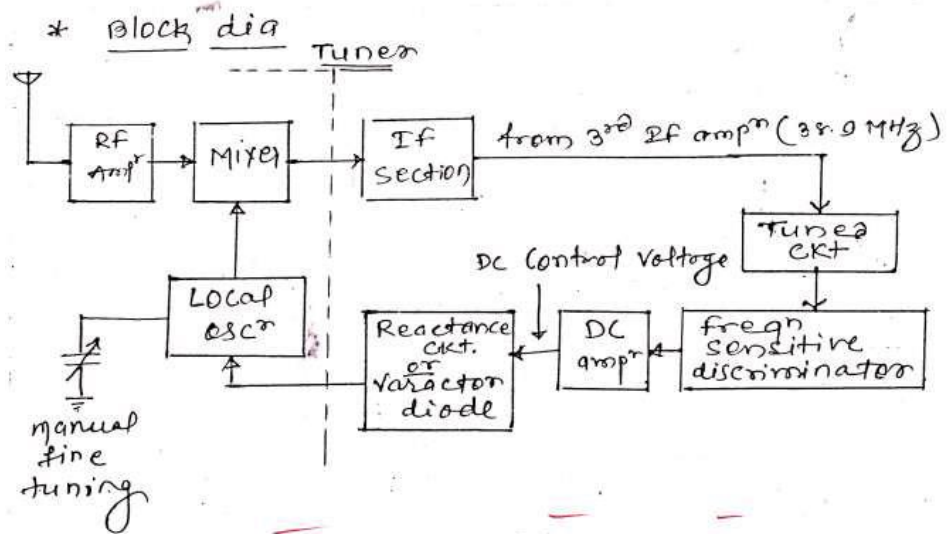
The main thrust of all microcontroller is based control system is channel selection and fine tuning. For this, frequency synthesizer is used which enables crystal accuracy of the local oscillator frequency for all channels. Several facilities that become available in microcontroller controlled system include.

- Auto seek programming
- Manual programming
- Digital 'LED' display of the selected channel
- Operation with or without remote control
- AFT control and
- Audio mute during channel hunting.
- For above reasons microcontroller in TV receiver is used.

(c) Draw block diagram of AFT in TV receiver and justify its need in TV receiver.

Ans:-

Diagram:- **02M**



Explanation:- **02M**

Need of AFT:-

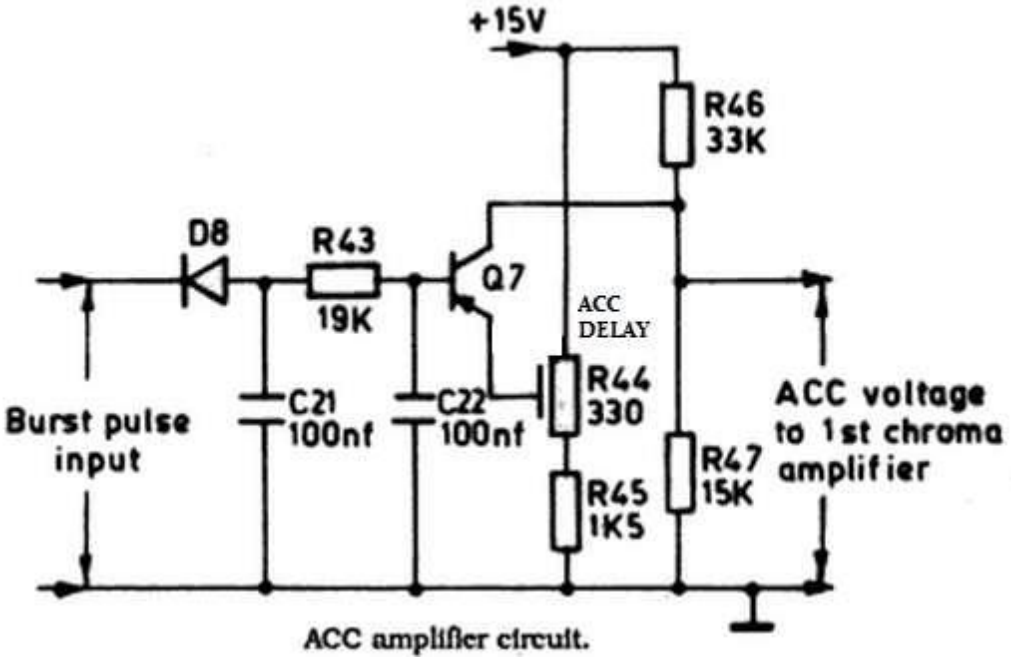
- The local oscillator frequency in the RF tuner is set to provide exact IF frequencies.
- To improve the stability of oscillator circuit, some drift does occur on account of ambient temperature changes, component ageing, power supply voltage fluctuations and so on.
- For a monochrome receiver a moderate amount of changes in the local oscillator frequency can be tolerated without much effect on the reproduced picture and sound output.
- The fine tuning control is adjusted occasionally to get a sharp picture.

(d) Give the principle on which ACC amplifier works. Draw the circuit of ACC amplifier and describe its working:

Ans:-

Diagram:- **02M**

The amplified burst signal that become available at the output of gated burst amplifier is also fed to diode D8 of the automatic colour control amplifier circuit as shown in fig.



ACC amplifier circuit.

Explanation **02M**

The diode together with filter (C21, R43, and C22) acts as a HWR-cum-filter to develop a negative going dc voltage at the base of Q7, which is proportional to the strength of received signal.

- As stated C21, R43 & C22 from a LPF to smooth any 4.43MHz variations present in the rectified signal. The output voltage at the collector of transistor Q7 is a positive voltage which increases or decreases with the strength of Chroma signal.
- This positive voltage is typically 7V under normal signal strength conditions. The resistor R44 provides an adjustable reverse bias for Q7 to delay its conduction until the Chroma signal exceeds a given threshold.
- The potentiometer formed by resistors R46 & R47 is used to obtain correct steady bias for the first Chroma amplifier. It is also necessary for making the collector of transistor Q7, negative w.r.t. its emitter.

(e) Compare LCD TV receiver with plasma TV receiver w.r.t. features (4 points).

Ans:- **01Meach**

Comparison:- (Any four)

Features	Plasma TV receiver	LCD TV receiver
Brightness	Very poor in direct sunlight without reflective design (battery powered devices);	Some panels are highly reflective, should be used in a dark environment for optimum picture quality
Contrast	Over 1,000:1	Over 1,000:1
Color	Good on most newer models	Excellent
Ghosting & Smearing	Display motion blur on models with slow response time, and the elimination technique (strobing backlight) can cause	None even during fast motion, advancements in 3D have eliminated phosphor trailing due to the use of fast switching phosphors

	eye-strain	
Response Time	1–8 ms typical (according to manufacturer data), older units could be as slow as 35 ms	Sub-millisecond
Environmental Influences	Low temperatures can cause slow response, high temperatures can cause poor contrast	High altitude pressure difference may cause poor function or buzzing noises
Aging	Yes	Yes
Weight	Light	Heavy, however, less weight gain per size increase

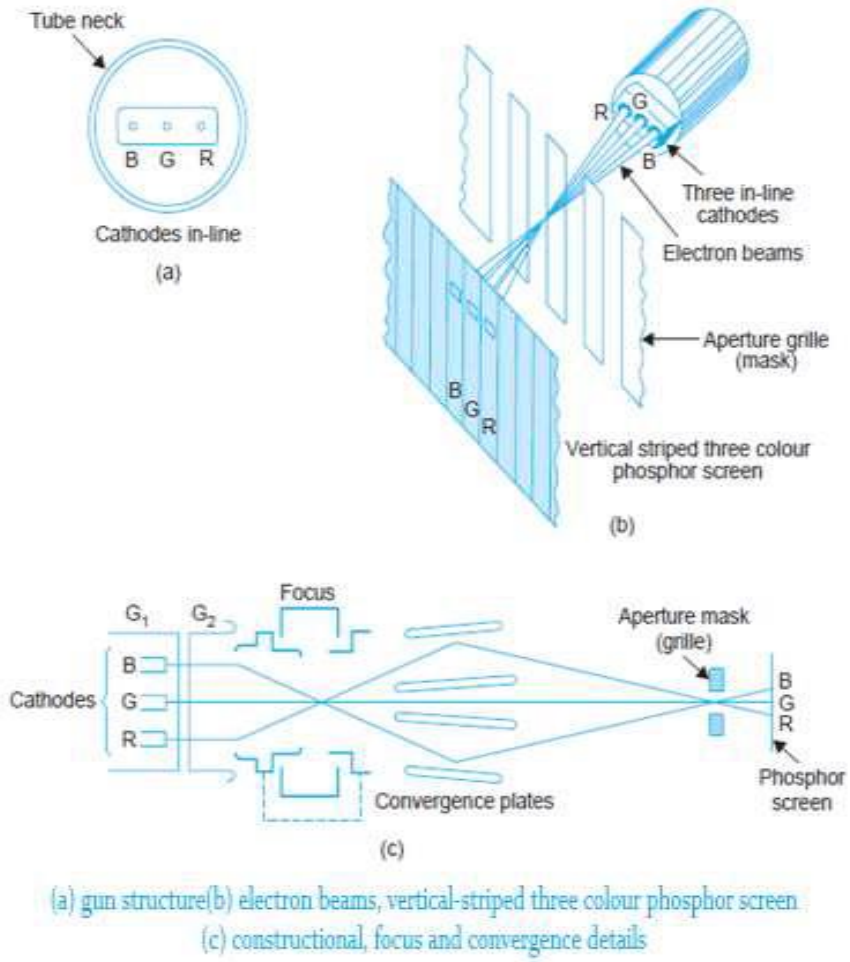
Q.4

(A) Attempt any three: **12M**

a) Explain the working of Trinitron picture tube with the help of well labeled diagram.

Ans:-

Diagram:- **02M**



(a) gun structure(b) electron beams, vertical-striped three colour phosphor screen
(c) constructional, focus and convergence details

Explanation:- **02M**

- The Trinitron or three in-line cathodes color picture tube was developed by 'SONY' Corporation of Japan around 1970. It employs a single gun having three in-line cathodes. This simplifies constructional problems since only one electron gun assembly is to be accommodated.
- The three phosphor triads are arranged in vertical strips as in the P.I.L. tube. Each strip is only a few thousandth of a centimeter wide. A metal aperture grille like mask is provided very close to the screen.
- It has one vertical slot for each phosphor triad. The grille is easy to manufacture and has greater electron transparency as compared to both delta-gun and P.I.L. tubes. The beam and mask structure, together with constructional and focusing details of the Trinitron are shown in Fig.
- The three beams are bent by an electrostatic lens system and appear to emerge from the same point in the lens assembly. Since the beams have a common focus plane a sharper image is obtained with good focus over the entire picture area. All this simplifies convergence problems and fewer adjustments are necessary.

(b) List any four advantages and four disadvantages of SAW filter in TV receiver.
Ans:

Advantages: (Any four) **1/2Meach**

- It enables significantly improved picture quality due to its excellent phase characteristics.
- It has high performance equivalent to several conventional coils.

- It saves circuit assembly hours when compared to discrete circuitry.
- It is small in width.
- It has very little deviation in characteristics with changes in temperature.
- It is adjustment free and hence cannot be tempered during servicing of the receiver.

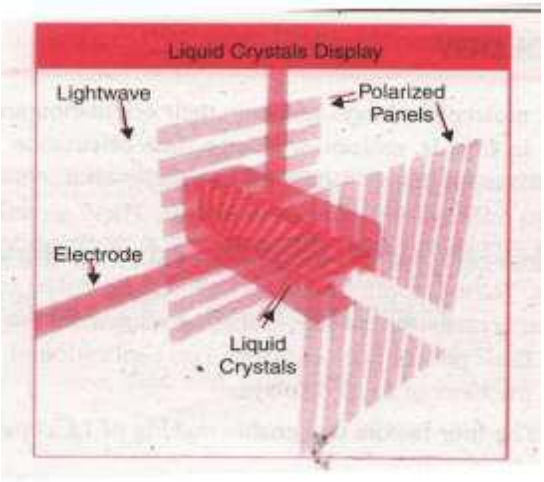
Disadvantages: (Any four) **1/2Meach**

- It is necessary to provide pre amplifier to compensate for the large uniform attenuation of the signal that occurs in the SAW filter.
- It is range limited.
- It has narrow bandwidth which may not be suitable for wideband applications.
- Manufacturing is difficult.

(c) Describe the orientation of liquid crystal to form a matrix of picture pixels.

Ans:

Diagram:- **01M**



Explanation:- **03M**

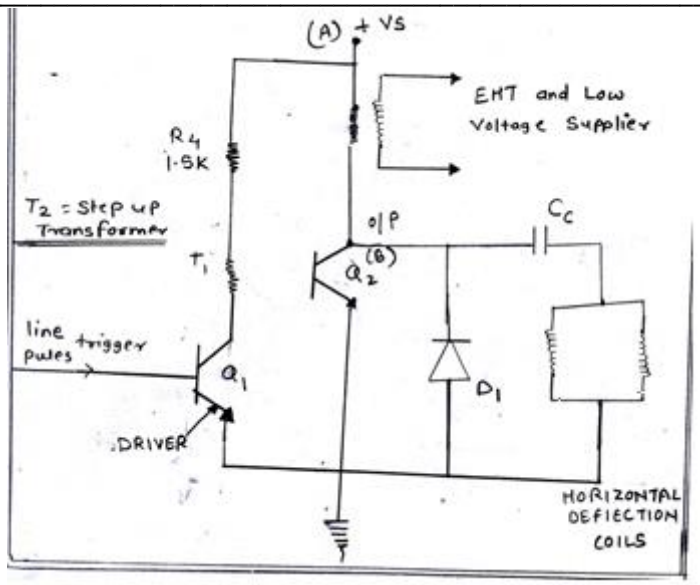
Formation of a matrix of picture pixels:

- As any incident light strikes the first glass filter it is polarized. The molecules in each layer of the applied nematic crystals then guide the light they receive to the next layer.
- As the light passes through the liquid crystal layers, its molecules also change the light's plane of vibrations to match their own angle.
- Then light reaches the far side of the liquid crystal substance, it vibrates at the same angle as the final layer molecules. If the final layer is matched up with the second polarized glass filter then the light will pass through.
- If an electric charge is applied to liquid crystal molecules they untwist. On straightening out they change the angle of light passing through them so that it no longer matches the angle of the top polarized filter.
- Consequently, no light can pass through that area of LCD, which makes it darker than the surrounding area.

(d) Draw H-output amplifier circuit and explain its working.

Ans:

Diagram :- **02M**

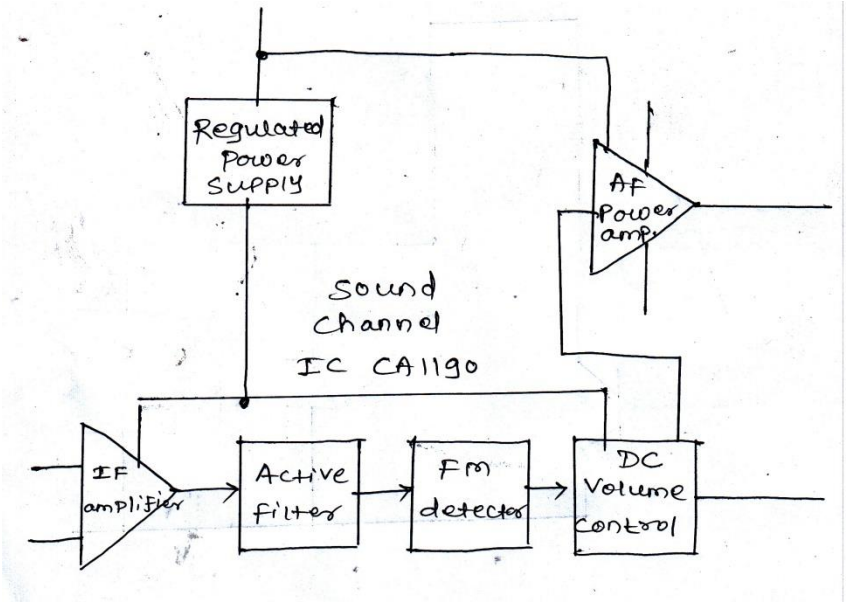


Working :- **02M**

- The principle of diode spilt addition is illustrated in fig where three layers of secondary winding are shown wound round the feeroxide core of LOT while the three sections are shown separately. In actual practice, these are wound one above the other and are thus concentric. Each winding is identical to other and has the same no of turns.
- The same magnitude of voltage will be induced in each section every time the fly back derived input pules gets applied to primary winding.
- Because of close proximity of individual layers and interlayer capacitance exist between each of them .
- It is indicated in the diagram by capacitor in dotted chain form become these are not physical capacitor of a diode is connected between the end of layers of winding and start of the next the Ac voltage induced in each layers can be made to change.
- Up all the interlayer capacitance to the same voltage since the capacitance are effectively in series.
- The total voltage appearing at the output terminal is the sum of all voltage appearing across all of them.
- The diode shown connected in series between the layers are physically embedded in winding from an interlayer part of Transformer The three winding are so designed that voltage induced in each layer form the fly back Transformer is 8.33 Kv.
- This makes total potential equal to 25Kv and forms the EHT supply source.

Q.4 (B) Attempt any one: **06M**

(a) Draw schematic and explain the function of sound section IC 1190 in TV receiver.
Ans:
Schematic diagram: **03M**



Explanation:- **03M**

Input circuits:-

The synchronous video detector in the vision IF IC detects both video and inter carrier SIF signals. This output that becomes available at a pin of the IC are routed to many section of the receiver.

Regulated power supply:-

A unique feature of the section ICs is their centrally regulated dc supply. A zener diode establishes a control voltage which serves as reference to various voltage regulators that feed independent dc voltage to the IF amplifier-limiter.

IF Amplifier Limiter:-

The FM SIF signal as it enters the sound IC is quite weak and has some amplitude variations due to noise pulses and somewhat unequal amplification at the RF and IF stages of the receiver.

Active filter:-

The action filter is built around a transistor. Its feedback network is so designed that it provides a near 40 dB/decade attenuation to frequencies beyond the inter carrier SIF

FM detector

A somewhat modified form of the differential peak detector is provided in this IC.

AF amplifier

The FM detector output feeds into the preamplifier which is of the complementary symmetry type. The output stage consists of two N-P-N transistors which are biased for class AB operation to prevent any crossover distortion.

b) What is the requirement of chroma delay line? Draw its constructional detail and describe it's working.

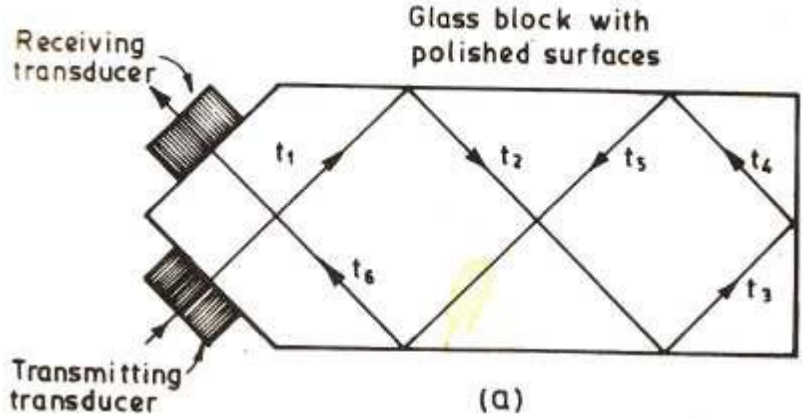
Ans:

Requirement of chroma delay line: **01M**

- It consists of a block of special glass (Isopaustic) fitted with two ultrasonic transducers. One transducer function to convert electrical signal into an ultrasonic signal whose mean frequency & amplitude variations are identical

to those of the electrical signal while the other converts that the ultrasonic signal into electrical form at the same frequency.

Construction diagram:- **03M**



Working: **02M**

- The electrical signal from the chroma amplifier with a mean frequency of 4.43MHz is coupled into the transmitting transducers where it is converted into an equivalent ultrasonic signal having the same mean frequency & pattern of amplitude variations. The signal travels through the glass block in a multiple path due to reaction from the polished surface before it reaches the receiving transducer.
- In the figure it is converted back into the original electrical form but delayed in time with respect to the signal at the input of transmitting transducer.
- The delay of signal is caused by low velocity of the ultrasonic signal as it passes through glass of the delay line. This is typically 3mm per μs as compared to the hundreds of thousands of mm per μs transferred by an electrical signal passing along a length of wire.

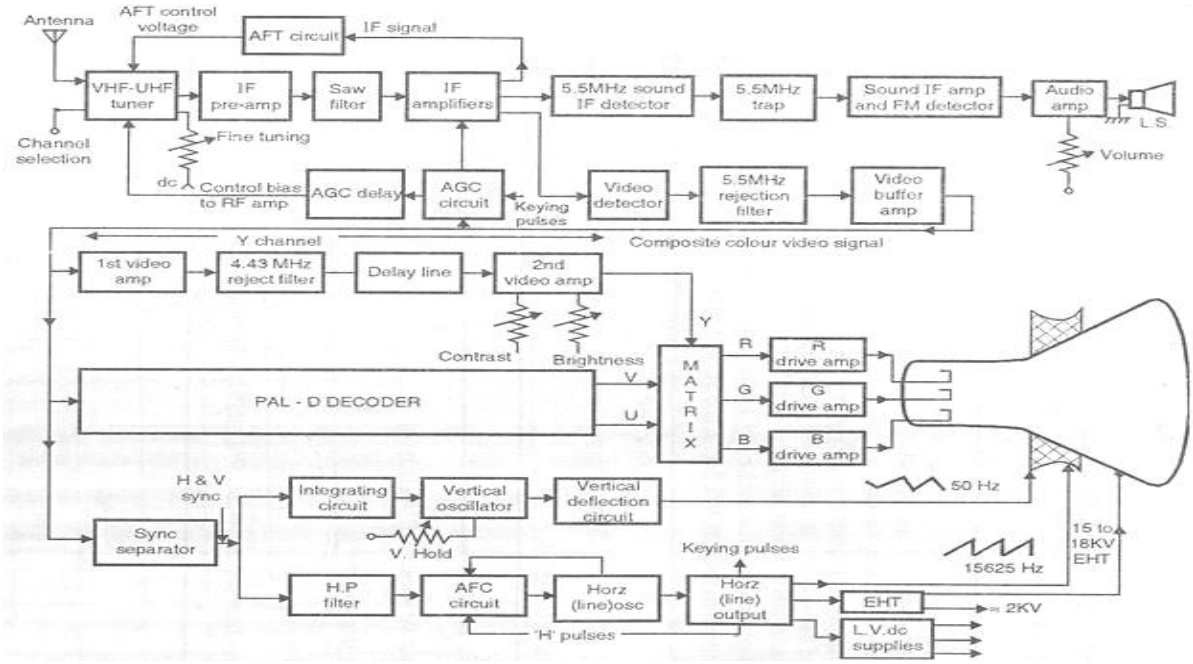
Q5 Attempt any two: **16M**

a) Draw block diagram of color TV Receiver and explain, how signal flow takes place in same.

Ans:-

Note: Any other relevant Diagram can be considered

Diagram:- **04M**



.Explanation:- **04M**

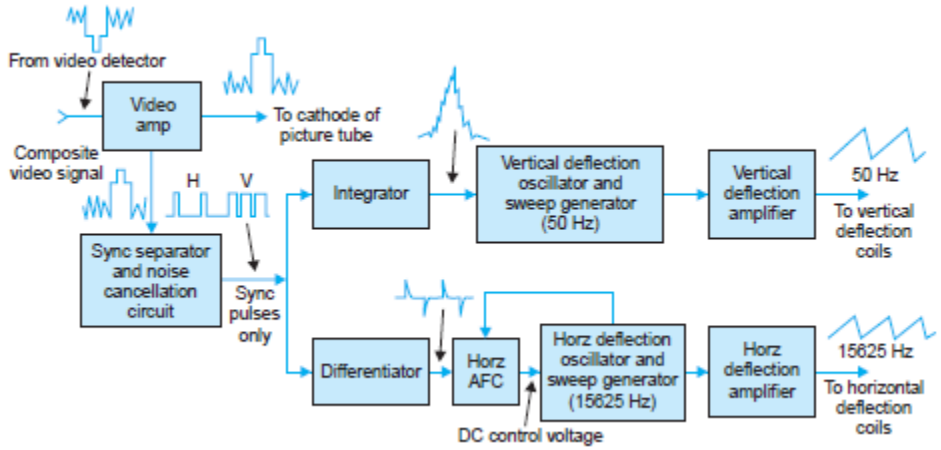
- A colour TV receiver contains all the necessary circuits of a monochrome receiver plus additional circuits required for the reproduction of a colored picture. Basically a colour TV receiver is a black-and-white receiver with a decoder for the colour signals and a colour picture tube.
- The figure is the functional block diagram of a colour TV receiver. The block diagram shows that the circuits like the RF tuner, VIF amplifier, the video amplifier, the deflection sync, the sweep circuits and the EHT sections are virtually the same as in black-and-white receiver.
- However there are some minor differences in design and details. For example the RF response in case of colour TV is kept more uniform than in monochrome receiver; this is to avoid any attenuation of the colour sub-carrier.
- The tuning of a colour TV is critical. To avoid any mistuning of the receiver, an arrangement called AFT (Automatic Fine Tuning) is used in most cases. This arrangement is similar to the AFC and can be switched off whenever manual tuning is required. The colour TV uses the inter carrier sound system with one difference.
- The sound take-off point is at the last VIF stage immediately before the video detector. This is done to avoid interference between the sound IF and the Chroma signal. A separate diode detector is used to produce the sound IF but the rest of the audio circuits are the same as in a monochrome receiver.

The two main circuits which distinguish a colour TV from a monochrome TV are the colour picture tube and the Chroma section containing the colour circuits.

b) Explain the function of sweep section with the help of heat block diagram.

Ans:-

Diagram: **04M**



Explanation:- **04M**

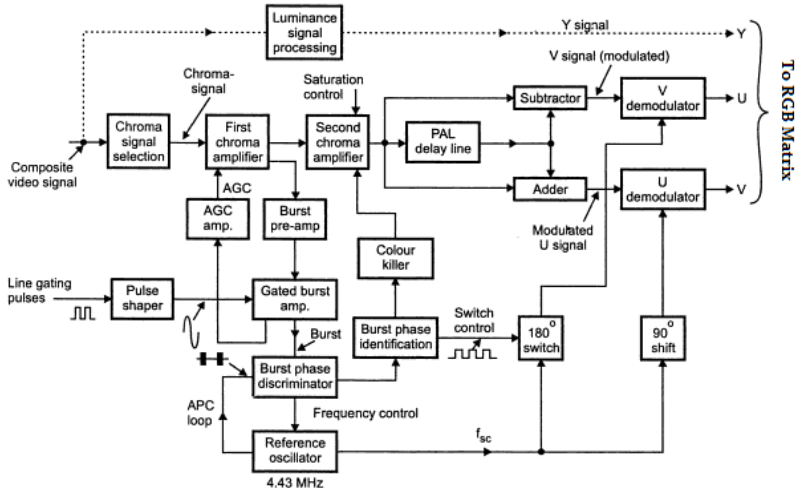
- The synchronizing pulses generally called 'sync' are part of the composite video signal as the top 25 percent of the signal amplitude.
- The sync pulses include horizontal, vertical and equalizing pulses. There are separated from the video signal by the sync separator.
- The clipped line (horizontal) and field (vertical) pulses are processed by appropriate line-pulse and field pulse circuitry. The sync output thus obtained is fed to the horizontal and vertical deflection oscillators to time the scanning frequencies.
- As a result, picture information is in correct position on the raster. The sequence of operations is illustrated in Fig. by a block schematic diagram.

c) Draw block diagram of PAL decoder and explain the function of each block.

Ans:-

***Note:** Any other relevant Diagram can be considered.*

Diagram:- **04M**



Block diagram of PAL-D decoder

Explanation:- **04M**

Chroma signal selection:

Its function is to select Chroma and colour burst signal from the incoming CCVS signal. It essentially consist of band pass circuit whose center frequency is chosen to be equal to that of Chroma sub-carrier itself i.e.4.43MHz.

1st Chroma amplifier:

The Chroma and burst signals are amplified by first Chroma amplifier which is controlled by DC voltage developed by the Automatic Chroma Control (ACC) amplifier.

2nd Chroma amplifier*:*

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

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

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

Gated burst amplifier*:*

The gated burst amplifier separates the burst pulses and amplifies them a level suitable to operate the burst phase discriminator.

Automatic Chroma Control (ACC*):*

The magnitude of the voltage so fed back is proportional to the magnitude of the burst and therefore to the amplitude of Chroma signal itself. This voltage is used to control the first stage of Chroma amplifier in such way to ensure constant Chroma signal amplitude.

Burst phase discriminator*:*

It is sensitive to burst pulses and is designed to detect any differences which might exist between the phase of burst pulse and that of the reference oscillator. It produces at its output a dc voltage whose magnitude and polarity are proportional to the magnitude and direction of the detected phase difference.

Burst phase identifier*:*

This circuit is able to identify the phase relationship of the colour burst.

180º switch*:*

This switch is used to periodically invert the waveform fed to the v-signal demodulator.

Colour killer control*:*

This is just a half wave rectifier which produces a steady dc potential from the succession of burst pulses. During black and white transmission the dc potential is absent and hence biases the 2nd Chroma amplifier to cut off state.

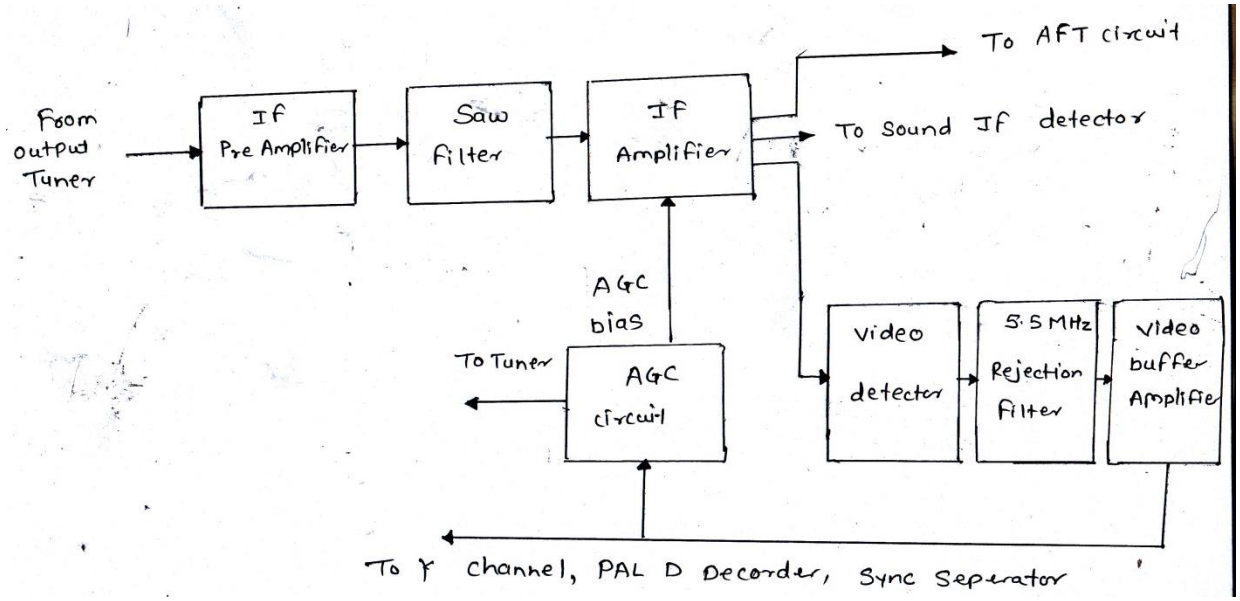
Q6 Attempt any four: **16M**

a) Draw block diagram of VIF stage.

Ans:-

Note: Any other relevant Diagram can be considered.

Diagram:- **04M**



b) List different methods of charging LCD. Explain any one method used in LCD TV Receiver.

Ans:-

List of different method of charging LCD **01M each**

To charge the LCD we need back it.

There are two types.

1. CCFL.
2. LED.

CCFL: (Any one Explanation) **02M**

- The preferred backlight for matrix-addressed large LCD panels such as in monitors and TVs was based on CCFLs, either by using two CCFLs at opposite edges of the LCD or by an array of CCFLs behind the LCD.
- Due to the disadvantages in comparison with LED illumination (higher voltage and power needed, thicker panel design, no high-speed switching, faster aging), LED backlighting is becoming more popular.

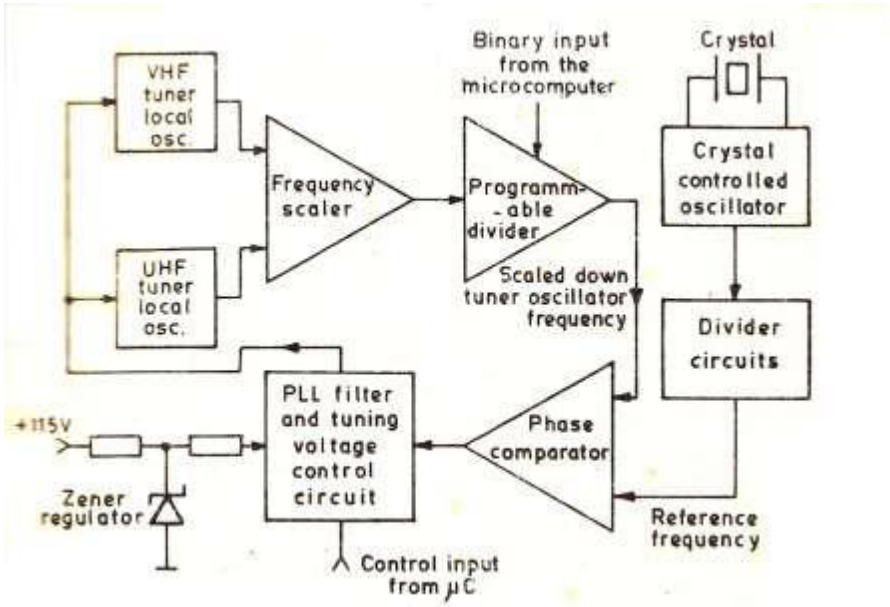
LED:

- In traditional LCD, the light is provided by a cold cathode fluorescent lamp (CCFL). But the more modern LCD panels use light emitting diodes (LED's) for the back light. Manufacturers prefer to call such a panel an LED TV.
- The terms LED TV is a misnomer as LED are not used as active transducers. It is actually an LCD which is used as a transducer; and LEDs are used to provide a source of back light only, in place of CCFL. The back light can be produced by using LEDs in blocks directly behind the screen (called back lit screen).
- Alternatively, they can be placed around the edge of the screen (called edge lit screen.).In the edge lit screen, the light spreads out across the back from the sides.
- While the back lit screen did reduce the thickness of the screen from about 20 cm to about 5 cm the real breakthrough came with edge lit systems, which made the thickness smaller than 1 cm.
- Earlier LEDs, based on gallium arsenide semiconductor compounds were emitting red light only in the visible spectrum .Later, more components were discovered which could emit green and blue also.
- Hence its use as a source of back light become feasible as white light required for the purpose could be obtained.

c) Illustrate with diagram working of frequency synthesizer tuning.

Ans:-

Diagram: - **02M**



Explanation :- **02M**

- The reference oscillator is crystal and its frequency is reduced to 1 KHz by divider circuits.
- The aims being to reduce the frequency to a range that can be proceed and counted by standard logics circuit.
- The output of pre-scaler feeds into a programmable divider, the divide ratio of which is determined by microcomputer.
- The output of programmable divider is compared with reference frequency by phase comparator.
- The inputs to the comparators are of same frequency, the dc error voltage developed by PLL filter is zero and no correction is applied.

- If there is mismatch in the input of comparator the correct voltages are generated by PLL filter i.e, the comparator senses the difference and develops appropriate error voltage which gets added to the applied tuning voltage with proper polarity that the oscillator is forced to return to the correct frequency.
- The PLL circuit continuously monitors the local oscillator frequency and applies necessary corrections.

d) Describe 3D TV technology. Why special glasses are required to for watching 3D programmers

Ans:-

Explanation: **02M**

- The 3D system relies on a visual process called STEREOPSIS which enables 3D perception. This comes out of the fact that the eyes of an adult human lie about 2.5inches (≈6.5cm) apart which lets each eye see objects from slightly different angles.
- The combined effect of this on the viewer's mind is that of a three dimensional picture.
- This ability of our eyes is used in 3D TVs by showing the same object from difference angles on the screen to cause the same the same 3D perception.
- Everyone sitting around 3D TV must wear special glasses to see the 3D effect.
- Without glasses the image on the TV screen will appear doubled, distorted and for most practical purposes unwatchable.
- Currently there is no technology that enables watching 2D and 3D content simultaneously without glasses.

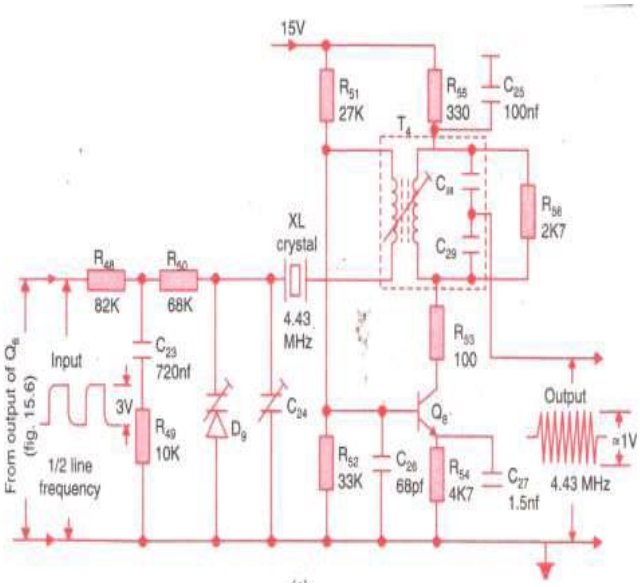
Necessary of glasses:- **02M**

- The technique used in 3D TV receiver for display of pictures on screen were based on the use of two video signals in different ways to create the illusion of 3D pictures when viewed with special glasses.
- In 3D the phosphor strips of green colour of picture tube are excited by G video signal originated at one of the two cameras.
- Similarly all red phosphor strips are excited by R video signal generated by another camera and blue phosphor strips are not excited at all.
- Therefore special filter glasses are needed to be worn while watching 3D picture on TV screen.

e) State need of reference oscillator and draw its circuit diagram

Ans:

Circuit Diagram **02M**



Explanation **02M**

Need of reference oscillator in PAL- D decoder:

- The U and V Chroma signals are separately produced at the transmitting end by what is known as double-balanced suppressed-carrier modulator.
- Thus it is necessary to regenerate the subcarrier in the receiver to affect demodulation of colour difference signal.
- The reference oscillator circuit that generates a sinusoidal output at 4.43MHz is shown in figure above.
- The frequency is determined by the center-resonant frequency of the crystal (XL) which in this circuit is approximately 4.43MHz.