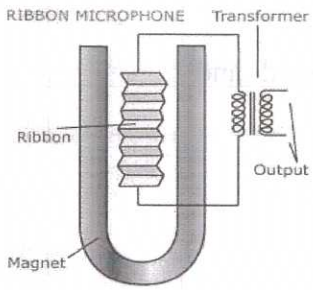
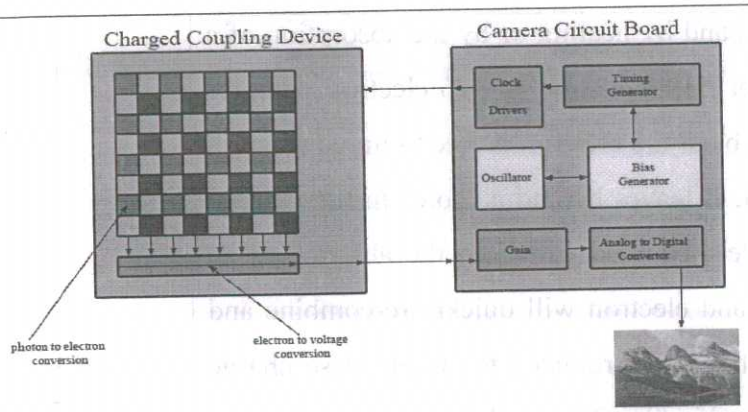
COURSE: TELEVISION ENGINEERING

Revision: (2015) **Course Code: 6046**

Qn. No	Scoring Indicators	Split up Score	Sub Total	Total
	PART A	2	2	2
I(1)	Principle of microphone is a transducer which picks up sound and converts it in to electrical signals. Types: • Dynamic microphone /Moving coil • Condenser microphone/capacitor type • Ribbon microphone			
I(2)	In NTSC- 525 lines of resolution per frame at 30fps, 60Hz field frequency 6MHz analog channel for transmission In PAL-625lines of resolution per frame at 25fps,50Hz field frequency, 8MHz analog channel for transmission In SECAM- 625lines of resolution per frame at 25fps,color signals are transmitted sequentially.	2	2	2
I(3)	All light sensations to the eye are splitted in to three main colour groups namely red,blue and green.The optic nerve system integratesthe different colour impressions in accordance with the curve to perceive the actual colour of the object.	2	2	2
I(4)	LCD -Uses light modulating properties of liquid crystal do not emit light directly.back light is needed(cathode fluorescent lamp),Resolution is low,power requirement is low,switching time is slow,contract ratio is high. LED-Uses PN -junction diode which emits light when current passing through it.No back light is uses ,Resolution is high,power requirement is high,switching time is fast,contract ratio is low . OLED-Uses series of organic thin films between conductors a bright light is emitted when current is applied.No back light is uses ,Resolution is high,power requirement is less,switching time is fast,more flexibility .	2	2	2

I(5)	DTV Digital television standard is fast replacing Analog television. DTV uses superior image resolution and audio quality for given band width compatibility with computers and internet and consistency of reception over varying distances.	2	2	2
	PART B			
II(1)	i.  	2	6	6
	ii. A **ribbon microphone**, also known as a **ribbon velocity microphone**, **uses a thin aluminum, duraluminum or nanofilm of electrically conductive ribbon placed between the poles of a magnet to produce a voltage by electromagnetic induction.**	1		
	iii. principle of operation of ribbon microphone **A light metal ribbon is suspended between the poles of a magnet. As the ribbon vibrates, a voltage is induced at right angles to both the ribbon velocity and magnetic field direction and is picked off by contacts at the ends of the ribbon. Ribbon microphones are also called "velocity microphones".**			
	Induced voltage is proportional to the velocity of the ribbon and thus of the air particles in the sound wave, unlike in some other microphones where the voltage is proportional to the displacement of the diaphragm and the air.The advantage of the ribbon microphone the light ribbon had a much higher natural resonant frequency than diaphragms in existing microphones, above hearing range, so it had flatter response at high frequencies. .	3		
II(2)	i. Block diagram of CCD Camera			



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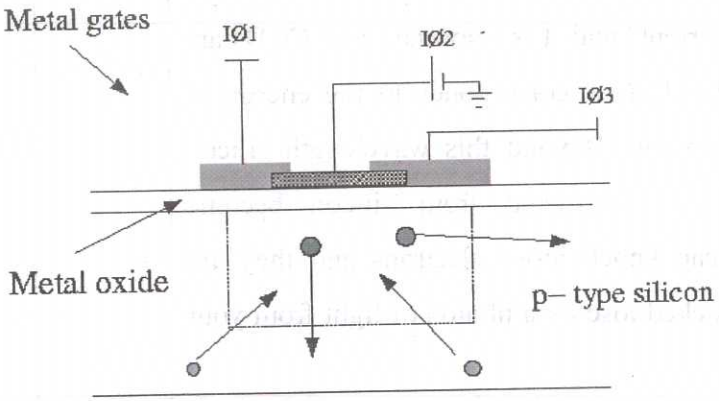
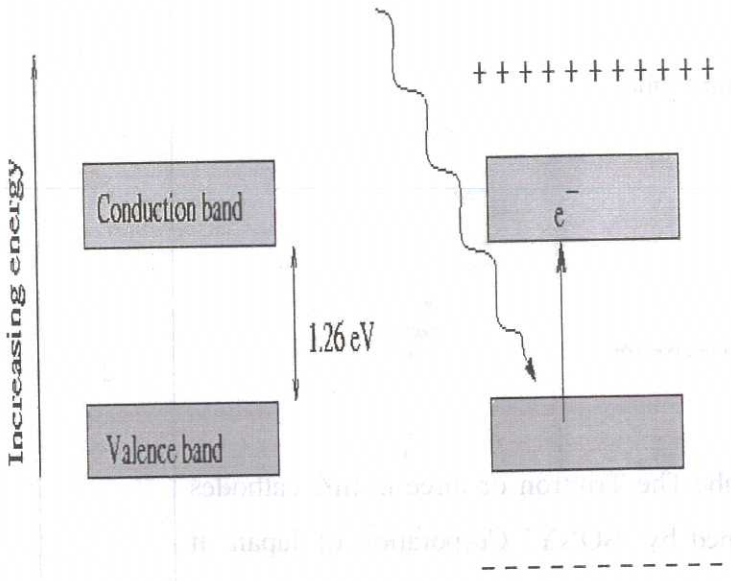
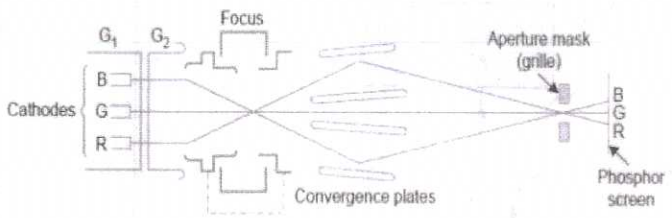
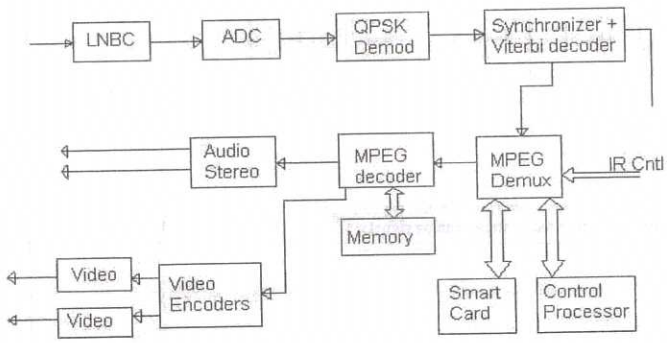


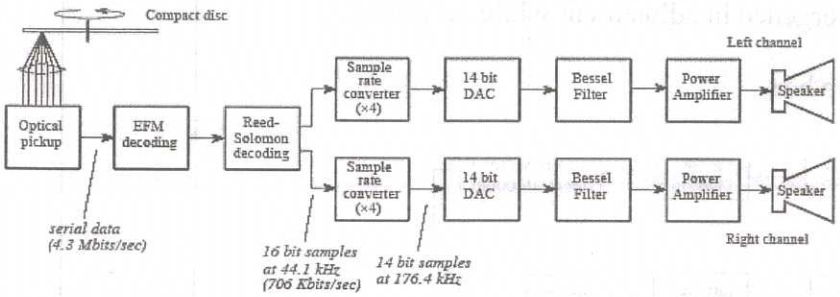
ii. Operation of CCD camera



The photoelectric effect is fundamental to the operation of a CCD.Atoms in a silicon crystal have electrons arranged in discrete energy bands. The lower energy band is called the Valence Band, the upper band is the Conduction Band. Most of the electrons occupy the Valence band but can

	be excited into the conduction band by heating or by the absorption of a photon. The energy required for this transition is 1.26 electron volts for silicon.Once in this conduction band the electron is free to move about in the lattice of the silicon crystal. It leaves behind a "hole" in the valence band which acts like a positively charged carrier.In the absence of an external electric field the hole and electron will quickly re-combine and be lost. In a CCD an electric field is introduced to sweep these charge carriers apart and prevent recombination.Thermally generated electrons are indistinguishable from photo-generated electrons. They constitute a noise source known as "Dark Current" and it is important that CCDs are kept cold to reduce their number.1.26eV corresponds to the energy of light with a wavelength of 1 micron. Beyond this wavelength silicon becomes transparent and CCDs constructed from silicon become insensitive. Jiggling of atoms can knock loose electrons and they are collected just as if they were knocked lose by a photon of light from your subject	4		
II(3)	i. Types of color picture tube a) PIL picture tube b) Delta gun picture tube c) Trinitron Picture tube ii. Diagram of Trinitron picture tube  	1 2	6	6
	Concept of Trinitron Picture tube:The Trintron or three in-line cathodes color picture tube was developed by 'SONY' Corporation of Japan .It employs a single gun electrode at its base having three in-line cathodes.Each is fed the amplified signal from one of the decoded RGB signals.The electrons from the cathode are aimed towards the single point at the back of the screen where they hit the aperture grille,a steel sheet with vertical slot cut in it.	3		

II(4)	Advantages:1.improved vertical resolution 2.sharper focus and brightest picture 3.no problem of convergence in adjustment while servicing. i. block diagram of set top box  SET TOP BOX BLOCK DIAGRAM **Operation of set top box** The set-top box contains a tuner, that tuner decodes the broadcast signal and decodes it in to a format that can be output to a television.Set-top boxes perform functions that can't be or are not normally done in TVs themselves.The main function that set-top boxes provide is to provide subscriber management functions. Pay TV content is normally encrypted or scrambled to stop customers getting content for free, the STB device needs to decrypt the content and it receives 'entitlements' from the operator based on the customers subscriptions.A bonus function that STBs provide to operators is managing the order and appearance of the programme guide. There is significant value to channels for their position in the programme guide (and/or channel number). Interactivity and value added services are also sale-able features. It enables a television set to become a user interface to the Internet and also enables a television set to receive and decode digital television (DTV) broadcasts.A set-top box is necessary to television viewers who wish to use their current analog television sets to receive digital broadcasts.In addition to the decoding of tv programs, the set-top box may perform other functions such as recording and playing back television programs and an electronic program guide. The set-top box may also be able to perform interactive functions such as video-on-demand, gaming and other entertainment services if there is a return channel available.Eventually the set-top-box might become obsolete because a new generation of televisions might be able to decode the digital television programs.	2 4	6	6

II(5)	i. Hi-Fi Stereo System  FIGURE 22-6 Compact disc playback block diagram. The digital information is retrieved from the disc with an optical sensor, corrected for EFM and Reed-Solomon encoding, and converted to stereo analog signals.	2	6	6
	ii.The digital information is retrieved from disc with an **opticalsensor,corrected fromEFM** and RS encoding and convertedtostereo **analog signals. Hi-Fi is a fairly** ambiguous term used to differentiate a **customized, high-end surround** sound system from built-in TV speakers. **The difference between low-fi** and high-fi comes down to the playback **equipment.In the past few decade**s, quality audio recording equipment has **become fairly easy to obtain, so** just about any music or video you'll want **to listen to will probably sound** pretty good. Additionally, even lossy **compression methods like MP3** are "good enough" for all but the most **discerning listeners, even when** played back on mid- to high-end **audiophile equipment.Basically,** the use for a Hi-Fi system is to make the **audio sound more authentic** and real. Many audiophiles focus on **headphones because unlike a spe**aker system, the sound isn't affected by **the acoustics of the room, leadi**ng to a much more consistent listening **experience. However, there**'s also a sense of instrument separation and **soundstage that is much less con**vincing on closed-back headphones than **on speakers, so open-backed** headphones are very popular among **audiophiles who demand the mos**t authentic audio experience possible.	4	6	
II(6)	**i. R-Y and B-Y Signal definition**B-Y,R-Y signal components are linear **combinations of signals represen**ting the three primary colors: green, blue **and red. Possible sources of Y**,B-Y,R-Y signals are cameras, analog **component videocassette recorde**rs and composite video decoders.	3		
	ii. significance of selecting R-Y and B-Y signalAs for the chrominance **component, it is first** 'purified' by removing the luminance component **from each primary colour, resulti**ng in what is known as *colour difference signals*: R-Y G-Y B- Y.Since the luminance signal $Y = R + G + B$, only two colour difference signals need to be transmitted, namely *R-Y* and *B-Y*.The third colour difference, *G-Y* may be recovered at the receiver from the three transmitted components: *Y*, *R-Y* and *B-Y*In analogue TV *broadcasting, the two colour diff*erence signals *R-Y* and *B-Y* are known as *U* and *V* respectively	3	6	6
II(7)	i. List the video compression techniques MPEG1,MPEG2,MPEG4			

ii. Explanation of different types:The MPEG-1 standard was primarily targeted for multimedia CD-ROM applications at a bit rate of 1.5 Mbits/sec. The standard is generic in the sense that it specifics a syntax for the representation of the encoded bitstream and a method of decoding. Unlike JPEG, MPEG-1 does not stipulate use of specific algorithms for bitstream generation and allows substantial flexibility. The syntax supports operations such as motion estimation; motion compensated prediction; Discrete Cosine transforms (DCT); quantization and variable length coding. The standard supports a number of parameters that can be specified in the bit-stream itself and a variety of picture sizes, aspect ratios etc. are permissible.

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MPEG-2 must support interlaced video as well since this is one of the options for digital broadcast TV and HDTV. • In interlaced video each frame consists of two fields, referred to as the top-field and the bottom-field. – In a Frame-picture, all scanlines from both fields are interleaved to form a single frame, then divided into 16×16 macroblocks and coded using MC. – If each field is treated as a separate picture, then it is called Field-picture.Video • 2-15 or 16-80 Mbit/s bit rate (target bit rate: 49 Mbit/sec) • TV and HDTV picture formats • Supports interlaced material • MPEG-2 consists of profiles and levels • Main Profile, Main Level) refers to 720x480 resolution video at 30 frames/sec, at bit rates up to 15 Mbit/sec for NTSC video (typical ~4 Mbit/sec) • Main Profile, High Level refers to HDTV resolution of 1920x1152 pixels at 30 frames/sec, at a bit rate up to 80 Mbit/sec (typical ~15 Mbit/sec) .

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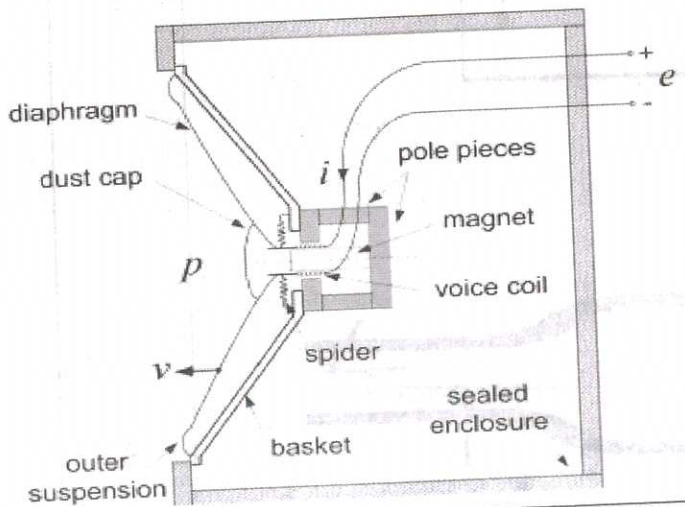
The MPEG-4 has followed a different approach towards the standardization of algorithms, as compared to MPEG-1 and MPEG-2. standards, complete algorithms for audio, video and system aspects were standardized. MPEG-4 in contrast, follows a toolbox approach in which tools are standardized.Video tools include a complete algorithm, or individual modules such as shape coding, motion compensation, texture coding etc. These independent coding tools can be bound together using the MPEG-4 Systems Description Language (MSDL).

PART C

III

a) i) block diagram of electro dynamic loud speaker



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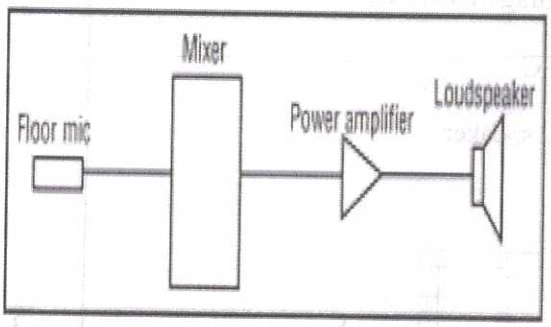
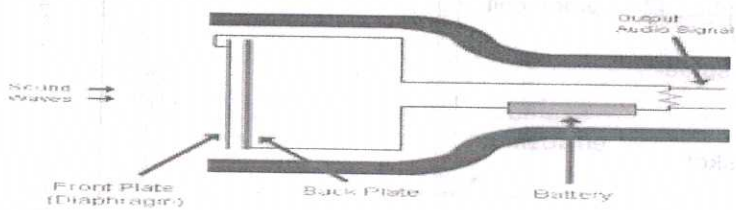
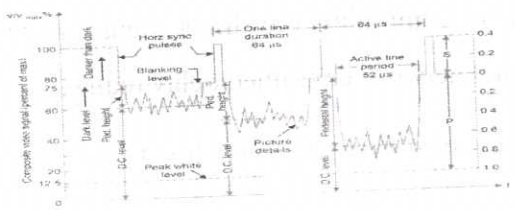
	ii)Diaphragm : pushes air in and out. Dustcap:protects the coil from dirt and dust. Surrround: It a piece of either foam, elastic rubber or textile that is used to flexibly fix the cone to the outer frame. Basket: It is the sturdy metal framework in which the speaker is built around. Spider (suspension): It is a flexible support that holds the coil in place a it moves freely. Magnet:made up of powerful neodymium Bottom plate:made of soft iron. Pole piece: It concentrates the magnetic field produced by the voice coil Voice Coil: This is the coil that moves the cone back and forth Former: It is a cylinder of cardboard or other materials on which the coil is wound	3		
	iii) Working of electrodynamic loudspeakerspeaker uses an electromagnet to turn electric signals of varying strength into movement. The coil of copper wire moves as the magnet energizes. This works using induction. The coil is connected to a cardboard/paper/vinyl "cone". The cone is a diaphragm that vibrates along with the coil. Sound is created and amplified by the diaphragm.	3	9	
	b) PA SYSTEM:A public address system (PA system) is an electronic system comprising microphones, amplifiers, loudspeakers, and related equipment. It increases the apparent volume (loudness) of a human voice, musical instrument, or other acoustic sound source or recorded sound or music. PA systems are used in any public venue that requires that an announcer, performer, etc. be sufficiently audible at a distance or over a large area. Typical applications include sports stadiums, public transportation vehicles and facilities, and live or recorded music venues and events. A PA system may include multiple microphones or other sound sources, a mixing console to combine and modify multiple sources, and multiple amplifiers and loudspeakers for louder volume or wider distribution.	4		15
		2	6	
IV	a.Condenser Microphones 	3		

	Condenser is the other word use of capacitor . Diaphragm:Thin metal strip suspended next to charged electric plate.Diaphragm is one side of a capacitor which moves in reaction to change in a sound field.Two plates are charged the motion changes thevoltage between 2plates and these voltage changes induced electron flow.It require some external power source.diaphragm is very light and is more sensitive than dynamic mic. b)Dolby *A* -first noise reduction system. It was intended for use in professional recording studios, where it became commonplace, gaining widespread acceptance at the same time has multitrack recording became standard. The input signal is split into frequency bands by four filters with 12 dB per octave slopes, with cutoff frequencies (3 dB down points) as follows: high–passat 80 Hz; band–pass from 80 Hz to 3 kHz; a low–pass from 3 kHz; and another low–pass at 9 kHz. The commander circuit has a threshold of -40 dB, with a ratio of 2:1 for a compression/expansion of 10 dB. This provides about 10 dB of noise reduction increasing to a possible 15 dB at 15 kHz. DOLBY B:Dolby *B* was developed after Dolby *A* it has a single sliding band system providing about 9 dB noise reduction (A-weighted), primarily for cassettes.It was much simpler than Dolby *A* and therefore much less expensive to implement in consumer products.DolbyB recordings are acceptable when played back on equipment that does not possess a Dolby *D*ecoder, such as most inexpensive portable and car cassette players. Without the de-emphasis of the decoder, the sound will be perceived as brighter as high frequencies are emphasized, which can be used to offset "dull" high frequency response in inexpensive equipment. a) Composite Video Signal  	4 4 4 4	7 8	15
V				

Composite video signal consists of a camera signal, blanking pulses andsynchronizing pulses.

Pedestal-The difference between the black level and blanking level is known as the pedestal.

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

Pedestal height-Pedestal height is the distance between the pedestal level and the average value axis of the video signal.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.

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-equalising andpost-equalising pulses .

b) PAL decoder

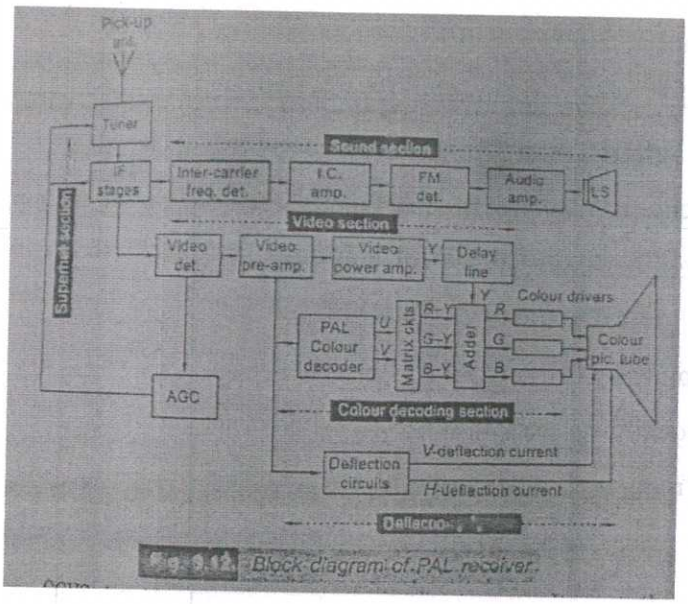


Fig. 9.12. Block diagram of PAL receiver

U and V signals are seperated by combining the direct signal and the delayed output in add and substract network combined delay matrix.

One signal has U+jV and phase reversed every alternate line U-jV.

Output addition=U+jV+U-jV(2U) and in subtraction=U+jV-(U-jV)(2jV).

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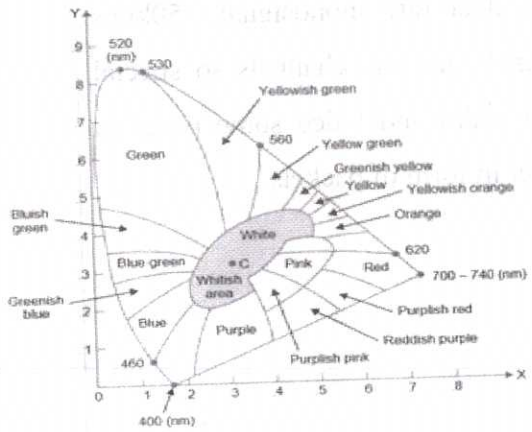
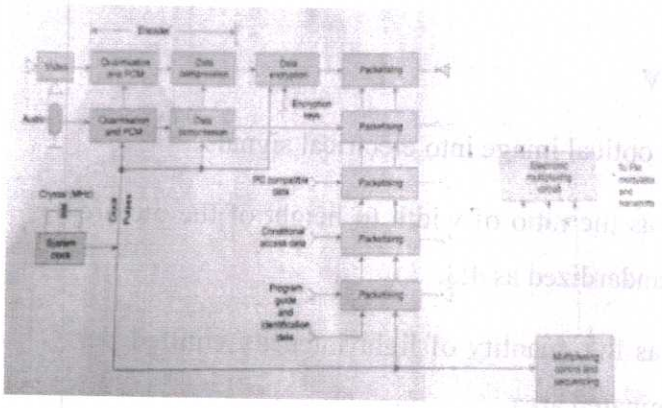
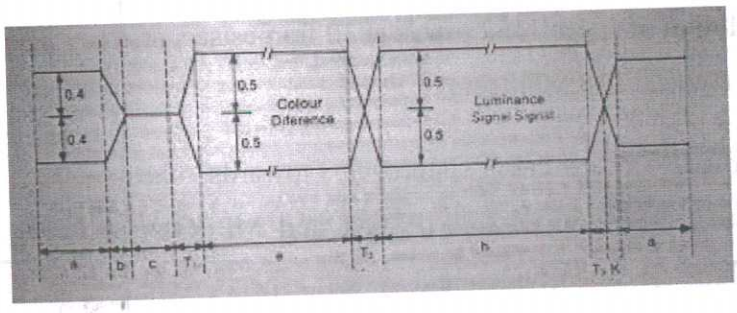
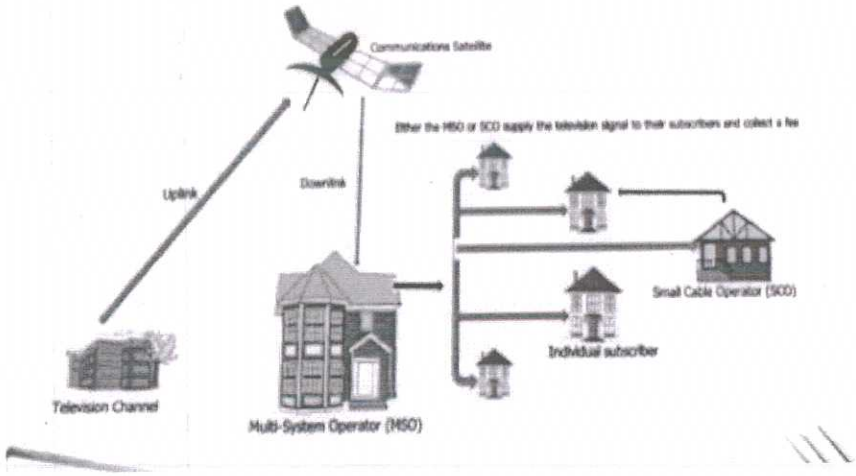
VI	Regenerated subcarrier is phase reversed on every alternate line after identification ton produce phased V-signals. These combined U,V,Y are matrixed to produce RGB colour primary.	3		
	a) Chromaticity diagram:convinient space for coordinate representation of spectrum colours and mixtures. RGB with tristimulus values of each.any others colours are mixed are appropriate modified components RGB are taken in account the relative luminosity curve of spectrum colours. RGB tristimulusvalues $r = R/(R+G+B)$ $g = G/(R+G+B)$ $b = B/(R+G+B)$ rgb are chromaticity coordinates and $r + g + b = 1$	4		
		4	8	
	b) Fundamentals of colour TV Camera tube is to convert an optical image into electrical signals. Aspect ratio can be defined as the ratio of width to height of the picture frame. For television, it is standardized as 4:3. Luminance can be defined as the quantity of light intensity emitted per square centimeter of an illuminated area. Illuminance is the average luminous flux incident on to a surface. Scanning is the important process carried out in a television system inorder to obtaincontinuous frames and provides motion of picture. The	7	7	15

VII	scene is scanned both in thehorizontal and vertical directions simultaneously in a rabid rate. Hue or tint can be defined as the predominant spectral colour of the received light.The colour of any object is distinguished by its hue or tint. Saturation refers to the spectral purity of the colour light.It indicates the degree bywhich the colour is diluted by white. a)Digital TV Transmitter Four stage transmission1.signal quantization& encoding- video quantization: sampling frequency fs=2Fs,in standard TV bandwidth =5mhz and sampling rate=10mhz. 1.Audio Quantization: Sampling level varies 64-128 for recording and playback.128=2^7 so data are coded 7bit code form. Encoding- PCM encoder to quantize the analog signal to generate its binary form. 2.Processing -3stage-data compression data rate monosignal =50kbps stereo =300kbps,encryption-some channels are pay channels so special key to encrypt, packetising-addition to audio and video some program guide are also added and sent to customer in form of packets. 3.Modulation 4. Transmission  b) Hardware Parts of DTV 1)Memory device:storage device to store for future processing,sequencing 2)Clock pulse:synchronize different circuit and block in digital systems.	6 4	10	15

	3)Registers:temporary storage devices made of flipflops 4)Data communication code:commonly uses ASCII(7 bit code) 5)Data compression:To reduce the data 6)Data Encryption:to pevent unautherised receptionchannels or programs 7)Microprocessor & Mictocontroller = Controlling functions are done by using proceesors and controllers 8)A/D&D/A: conversion of signals.	5	5	
VIII	a) MAC signal transmission  With in line period the luminance and chrominance shouldbe transmitted sequentially.time compression is applied individually to luminance and chrominancesuch that64micro sec. Compression factor for luminace signal=3:2 Time period for luminance =35micro sec Compression factor for chrominance signal=3:1 Time period for chrominance=17.510microsec b)Explanation of different types : The MPEG-1 standard was primarily targeted for multimedia CD-ROM applications at a bit rate of 1.5 Mbits/sec. The standard is generic in the sense that it specifics a syntax for the representation of the encoded bitstream and a method of decoding. Unlike JPEG, MPEG-1 does not stipulate use of specific algorithms for bitstream generation and allows substantial flexibility. The syntax supports operations such as motion estimation; motion compensated prediction; Discrete Cosine transforms (DCT); quantization and variable length coding. The standard supports a number of parameters that can be specified in the bit-stream itself and a variety of picture sizes, aspect ratios etc. are permissible.	3 4 3	7	

	MPEG-2 must support interlaced video as well since this is one of the options for digital broadcast TV and HDTV. • In interlaced video each frame consists of two fields, referred to as the top-field and the bottom-field. – In a Frame-picture, all scanlines from both fields are interleaved to form a single frame, then divided into 16×16 macroblocks and coded using MC. – If each field is treated as a separate picture, then it is called Field-picture.Video • 2-15 or 16-80 Mbit/s bit rate (target bit rate: 49 Mbit/sec) • TV and HDTV picture formats • Supports interlaced material • MPEG-2 consists of profiles and levels • Main Profile, Main Level) refers to 720x480 resolution video at 30 frames/sec, at bit rates up to 15 Mbit/sec for NTSC video (typical ~4 Mbit/sec) • Main Profile, High Level refers to HDTV resolution of 1920x1152 pixels at 30 frames/sec, at a bit rate up to 80 Mbit/sec (typical ~15 Mbit/sec) .	3	8	15
	The MPEG-4 has followed a different approach towards the standardization of algorithms, as compared to MPEG-1 and MPEG-2. standards, complete algorithms for audio, video and system aspects were standardized. MPEG-4 in contrast, follows a toolbox approach in which tools are standardized.Video tools include a complete algorithm, or individual modules such as shape coding, motion compensation, texture coding etc. These independent coding tools can be bound together using the MPEG-4 Systems Description Language (MSDL).	2		
IX	a)Digital TV satellite system A satellite is any body that moves around another one in amathematically predictable path called orbit. Communication satellite:relay and amplifiers radio telecomminication signals via transponder. Currently approx 1071 artificial satellite orbiting the earth. Elements:Programming source,DBS provider broadcast center,Geostationary satellite,Dish antenna,TV receiver. Prgramming source:channel studio-proceesing subjects-encryption and compression-local country GEOSAT-GEOSAT transponder-DBS broadcast center DBS provider Broadcast Center:Receiving channel data-validation-decoding orginal one-encoding and compress by DBS provide-compression-MPEG2&4-send to Indian GEOSAT Geostationary Satellite:DBSprovider satellite-role of transponder-	6		

	distribution of transponder-adjust frequency-C(4-6Ghz) & KU(12-18Ghz)-send to provider dish Dish Antenna:dish shaped parabolic antenna-receiver electromagnetic signal from satellite-LNB:radio or electromagnetic waves to electrical signal. TV receiver:Abox shaped device that converts a digital signal to analog for viewing on conventional set.  	4	10	15
X	b) CATV system:cable TV but in orginally community antenna tv is a system for distributing televisionprograms to subscribers via radio frequency signal transmitted through coaxial.coaxial cable brings the signal to customer's building through a service drop,anoverhead or underhead cable.each programuses6MHz channels,spectrum between50&550MHZ,it can accommodate up to 80 channels,every subscriber receives same program. a) CAS:include a combination of scrambling way and encryption to prevent unautherized reception.scrambling is the process of changing the sound,picture and data unintelligible Requirements: Payment schemes ,multi-decoder households,sharing of the CA system,receiver/decoders,delivery system,CA system. b) LED & LCD display: LCD:Liquid Crystal Display in which liquid crystal is between display pannelget activated on receiving electric current .uses fluorescent lights. Working:two glasslayers are subtrates one is chrge of columns and other charge of rows.crystal is sandwiched in between two layers and uses grid to specific pixcels.when this happens the crystal untwist and allow light to pass through . LED: Light Emitting Diode is a 2 lead semiconductor light source.it is a	5 5 5	5 5 10	15

	p-n junction diode that emits light when activated. Working: when a suitable current is applied to the lead,electrons are able to recombine with eletron holes with in the device, releasing energy in the form of photons. Here led can be placed behind the sreen or around the edges.	5		