KLS Vishwanathrao Deshpande Institute of Technology

(Accredited by NAAC with "A" Grade)

(Approved by AICTE, New Delhi, Affiliated to VTU, Belagavi)

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

University / Model Question Paper Scheme & Solution

Faculty Name	:	Prof. Pooja. C. Shindhe
Course Name	:	Multimedia Communication
Course Code	:	BEC613A
Year of Question Paper	:	Model Question Paper
Date of Submission	:	31/01/2025

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Multimedia Communication 22-Scheme

Model Question Paper

Time: 3hrs Max Marks: 100

Note: Answer any Five full questions, choosing ONE full question from each module.

Module-1

1. a. Explain broadcast Television network & ISDN. (10 Marks)
   b. Explain the concept of speech only in Interpersonal Communication. (10 marks)

OR

2 a. Explain Data Network and Broadband multiservice network in detail with suitable figures. (10Marks)
   b. Explain in brief interactive application over internet. (10 marks)

Module-2

3 a. Illustrate the different types of text data representation. (10Marks)
   b. Describe the function of signal endover with the associated waveform. (10 marks)

OR

4 a. Explain Digitization principles & digitized document. (10 Marks)
   b. Write an Example explain formated text and hyper text. (10 marks)

Module 3

5 a. Explain GIF and TIFF format. (10 marks)
   b. With neat diagram, explain JPEG encoder (10 Marks)

OR

6 a. A series of message is to be transfered between two computes over PSTN, The message compress just the chareters. A through H. Analysis has shown A & B = 0.25. C & D = 0.14 E, F & G = & H = 0.55.
   i) use Huffman codiry to derive a codeword set. and prove this is the minimum set by constructing the Huffman code tree (10M)
   b. Define Distributed Multimedia system with neat blocks schematic and also highlight its features. (10Marks)

Module 4

7 a. Discues the prineiple of differential pulse code modulation with block diagram. (10Mark)
   b. What are video compression principles. explain with an example. (B-frames) (10 Marks)

OR

8 a. Explain H.261 video encoder.
   b. Explain the codiry principles of MPEG-4.

Module-5.

9a. Explain the physical and MAC sub-layer of LAN protocol. (10 marks)

b. Write short note on ARP and RARP. (10 marks)

OR

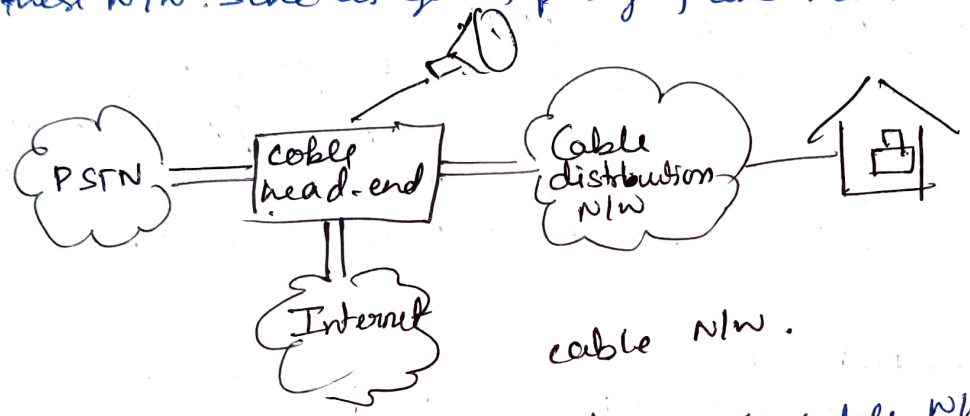
10a. Explain IP data gram format. (10 marks)

b. Explain the devices commonly used in LAN (10 marks)

* * * * *

1a. Broadcast Television Network.

→ These were designed to support the diffusion of analog television program throughout wide geographical areas
→ In case of large town or city, the broadcast medium is normally a cable distributed N/w. when for longer areas a satelite N/w or sometimes a terrestrial broadcast N/w is used.
→ Digital television services have become available with these N/w. Sche as games playing and home shopping.



cable N/w.

Figure shows the architecture of cable N/w's and satelite broadcast N/w.

→ The set-top box used provides not only control of the television channels but also access to other services.
→ The low bit rate channel is used to connect the subscriber to a BSTN and the high bit rate channel to connect the subscriber to the Internet

ISDN - Integrated services digital Network

→ These N/w's started to be deployed in early 1980's and were originally designed to provide PSTN users with the capability of having additional services.

These allow users either to have two different telephone calles in progress simultaneously or two different calles such as a telephone call and data calls with ISDN therfore, the access circuit is known as a digital subscriber Lenne (DSL)

→ In case of digital phone the Electron that are needed to convert the analog voice and call setup signals into a digital form are integrated into the phone handset.
→ The basic DSL office ISDN known as base rate access support two 64Kbps channels, used either as independent or as single combined 128 Kbps. channel.

1b. Speech only in Interpersonal Communication.

→ This may involve speech, image text or video.

Speech only: Basically speech only have been provided using telephone connected to either PSTN or PBX.

→ Alternatively, by using a multimedia PC user can make telephone calls through the PC. This requires computer telephone integration or CTI.

→ Many N/w's also support additional services. Two examples are voice mail and teleconferencing.

→ The Internet is also used to support telephony telephony over the Internet is also known as packet voice or become Internet protocol, Voice over IP.

2a. Data Network.

→ Data N/w were designed to provide basic data communication services such as electronic mail and general file. tranform.

→ The two most widely deployed n/w of this type are the X.25 network and the Internet. Because of the operational mode however the X.25 n/w is restricted to relatively low bit rate data applications and hence is unsuitable for most multimedia application.

→ The Internet is made up of vast collection of interconnected N/w all of which operate using the same set of comm. protocol. A common protocol is an agreed set of rules that are followed by all communicating parties.

→ The leads to the origin of term "Open Systems interconnection"

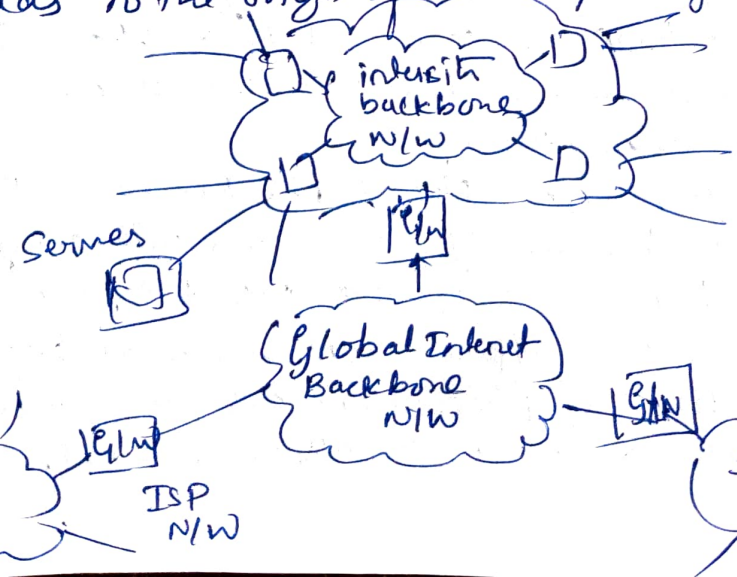
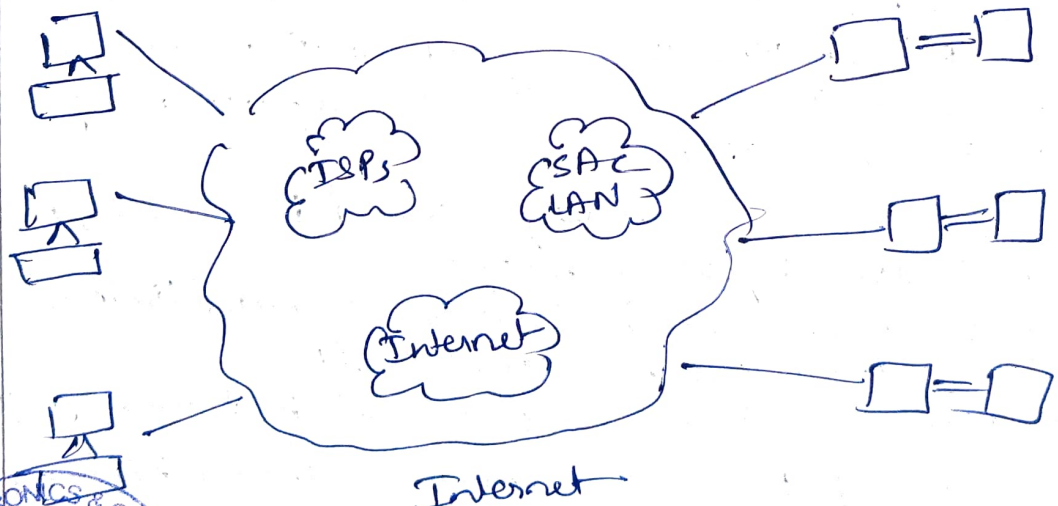


figure shows a different types of interconnected N/W.
→ Access to the internet is through an intermediate Internet services provide (ISP) N/W.
→ The user devices are connected to the ISP N/W either through a PSTN with modems or through an (ISDN)
→ If the business comprises only a single site or if it comprises multiple sites through an enterprise-wide private N/W.

2b. Interactive application over the Internet.
→ The Internet is extensively used to support a range of interactive applications, the most widely used being world wide web (WWW) or web servers
→ The comprises a linked set of multimedia info. servers geographically distributed around the Internet.
→ Each document comprises a linked set of page and the linkage between the pages are known as hyperlinks. These are pointers to others pages of same doc. or to any other doc. within the total web.
→ Document comprising only text are created using what is called hypertext, while those comprising multimedia info are created using hypermedia.



Interaction with a WWW server

→ There is no central authority for the introduction of documents into the web.
→ Each doc has a unique address known as uniform resource locator or URL - which identifies both location of server and also the reference on that server.
→ A standard format is used for writing doc. This is known as the hypertext markup language. (HTML)

3a. There are three types of text representation and enables pages to be created which comprises of strings of fixed-sized characters form limited character set.

i) Unformatted text. This is also known as plaintext and enable pages to be created which comprises of strings of fixed-sized characters from a limited character set.

ii) Formatted text - This is also known as richtext and enables pages and complete documents to be created which comprises of string of characters of different styles and shape with tables, graphics and images inserted at approximate points.

iii) Hypertext: This enables an integrated set of documents to be created which have defined linkages between them.

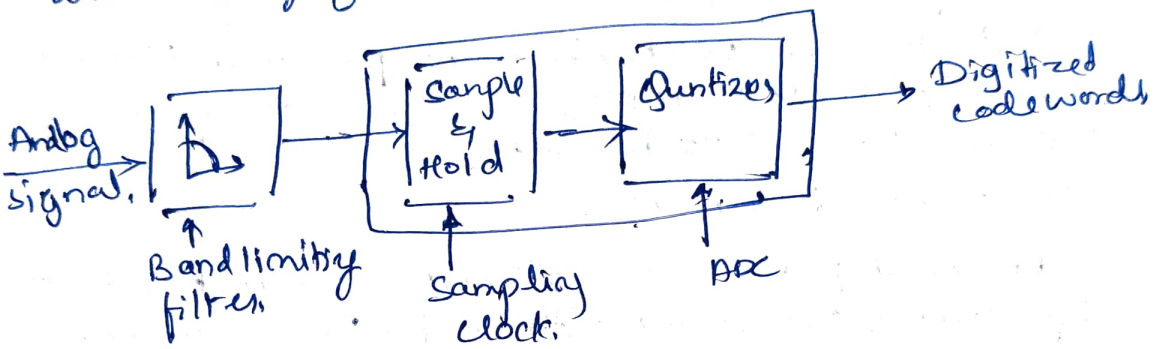
Two examples of character set that are widely used to create pages consisting of unformatted text string
i) Basic ASCII character set ii) Supplementary set of Mosaic characters.

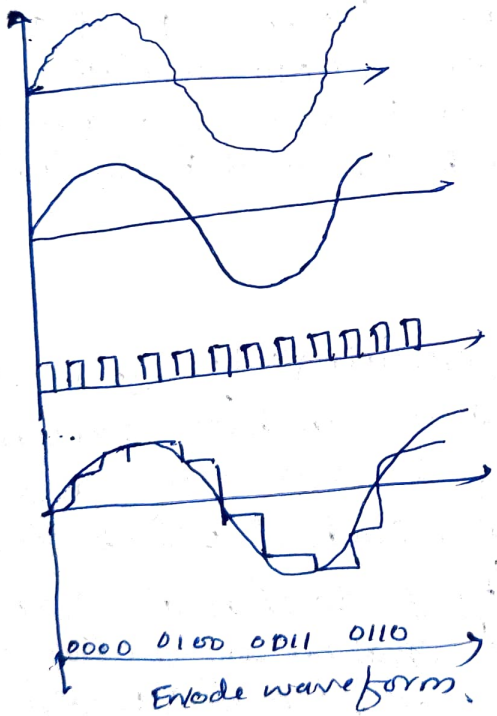
3b. The conversion of analog signal into a digital form is done by using encoder.
It consists of 2 main circuits. a band limiting filter and a analog to Digital converter. (ADC).
The latter consists of sample and hold and a quantizer.
The role of filter is to remove selected highest freq. components from the source signal.
To represent amplitude of analog signal correctly first the signal to be sampled at a rate which is higher than the maximum rate of change of the signal amplitude. ~~of sampled at a rate which~~

secondly, the number of different quantizing levels used to be as large as possible.

Sampling rate: Nyquist sampling theorem states that "in order to obtain an accurate representation of signal, its amplitude must be sampled at a maximum rate that is equal to or greater than twice the highest sinusoidal freq. component that is present in the signal". This is known as Nyquist rate.

The bandlimit filter is also known as antialiasing filter.





4a. Digitization Principles.

D Analog Signals.

→ A mathematical technique know as Fourier analysis can be used to show that only time-varying analog signal is made up of a possibly infinite number of single-frequency sinusoidal signal whose amplitud and phas vary continuously with time relative to each other.

→ The range of freq. of the sinusoidal component that make up a signal is called the signal BW.

→ Interms of speech, humans produces sounds range of 50Hz to 10KHz. In the case of music The rang is 15Hz to 20KHz.

Digitized documents.

→ An example of a digitized documet is that produced by scanner associated with a faksimile machine.

→ As each line is scanned, then o/p of the scanner is digitized to a resolution of approximately 8 pixel.

→ The use of a ~~sign~~ single binary digit per pel means that fax machin are best suited to scanning blacks white images.

4b. Formatted Text..

Ex. Ms word, Libaro Office, kingsoft office. etc.

word processing packages enables document to be created that consists of characters of different styles of variable size of shape, each of which can be plain bold or italicized, variety of document formatting options are supported to enable an author to structure a document into chapter of picture inserted at approximate points.

Example formatted Text string

<B><FONT SIZE=4><P>FORMatted Tex</P>
</B></FONT>.

Hypertext.

It is a type of formatted text enables a related set of documents (known as pages) to be created which define linkage points on pages referred to as hyperlinks between pages.

Ex: Universities describe their structure & the course & support services they offer in prospectes, a booklet organised in a hierarchical way.

These can be used to create an electronic version of such documents (pages) with the index, description of departments.

5a. Graphics Interchanges format (GIF)

GIF is used extensively with the Internet for the representation and compression of graphical images.

→ Although color images compressing 24-bit pixels are supported 8-bits each for R:G&B - GIF reduces the number of possible colors that are present by choosing the 256 colors from the original set of 2^{24} colors, that match most closely those used in the orriginal image. The resulting table of colors therefore consist of 256 entries, each of which contain a 24-bits colour value

Tagged Image file format (TIFF)

. It supports pixel resolutions of up to 48 bits, and is intended for the transfer of both images and digitized documents.

→ The image data, can be shooted stored, transfered over the NW in a number of different formats.

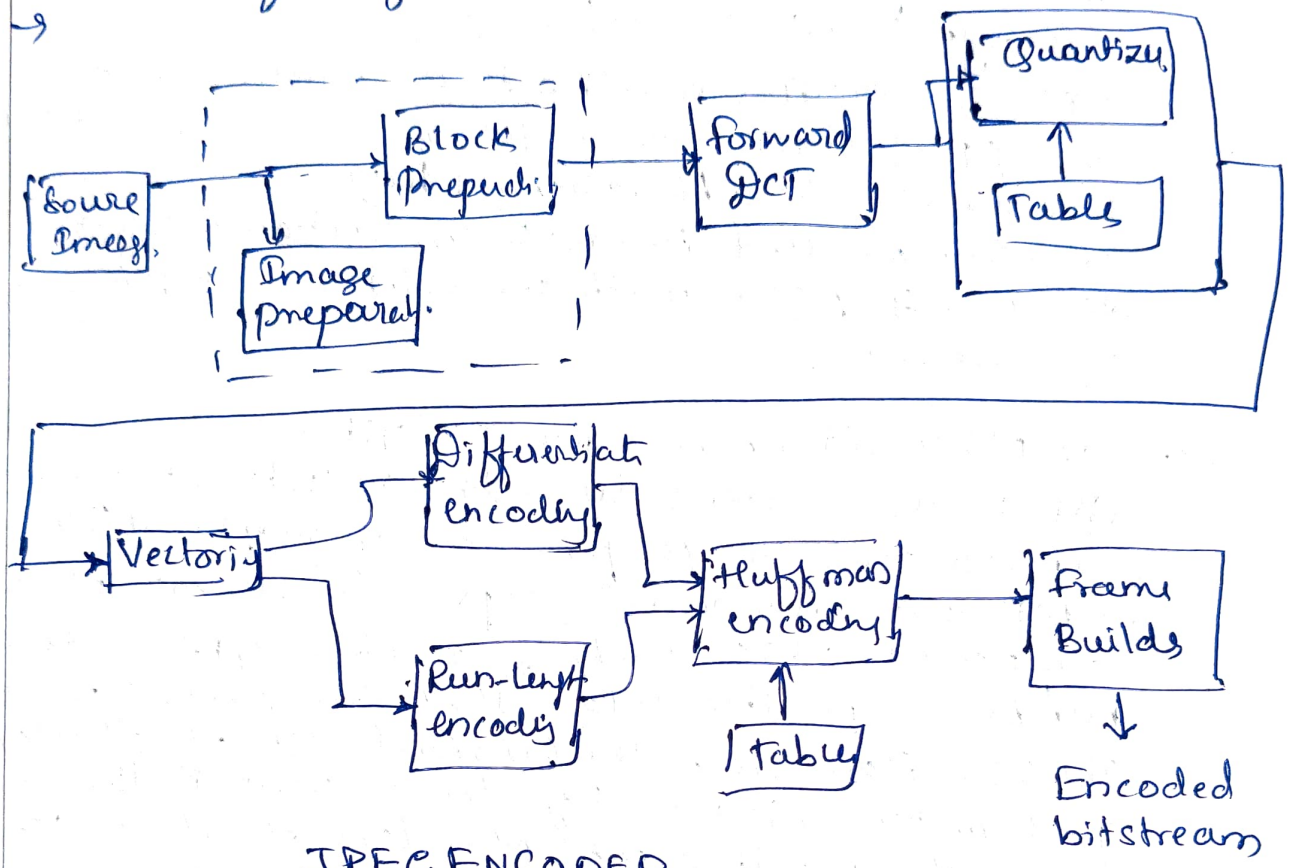
→ The LZW compression algorithm is same as that used with GIF.

5b JPEG Encoder.

In order for the decoder to be able to intrpret all the diff fields and tables that make up the bitstream it is necessary to delemit each field and set of table values in a defined ways.

→ The role of the frame builder is to encapsulate all the information relating to an encoded image/picture in this format. and as we can see, structure of a frame is hierarchical.

→

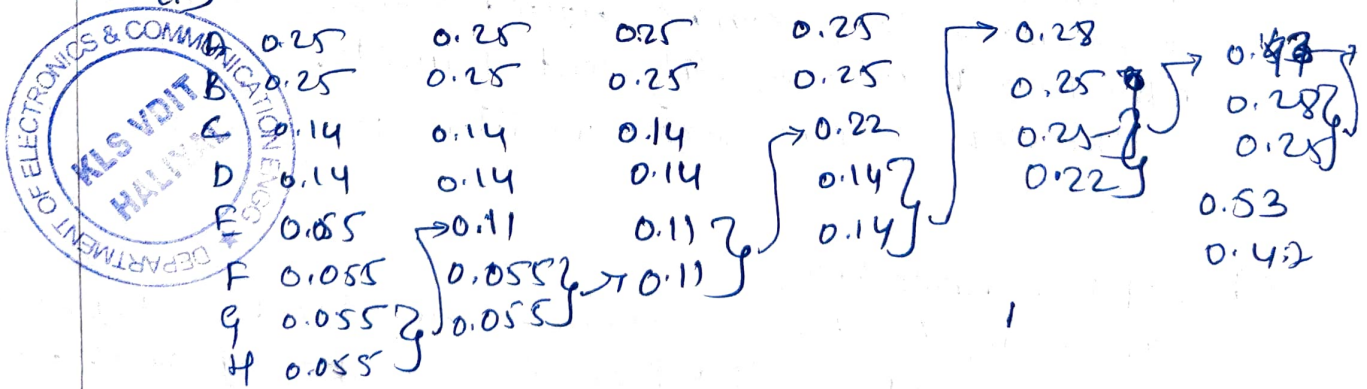


JPEG ENCODER

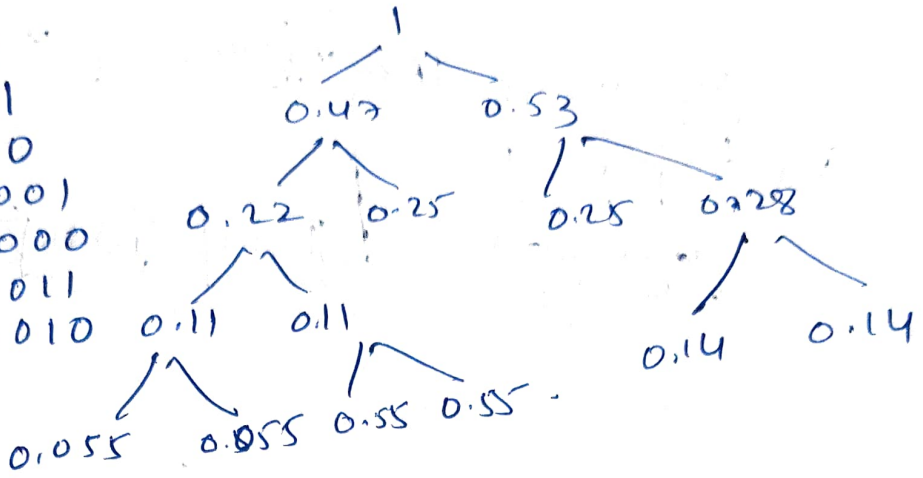
6a. i) $H \rightarrow (2(0.25 \log_2 0.25) + 0.2(0.14 \log_2 0.14) + 4(0.55 \log_2 0.55)$

$H = 2.125$ bits per codeword.

ii)



A – 10
B – 01
C – 111
D – 110
E – 0001
F – 0000
G – 0011
H – 0010

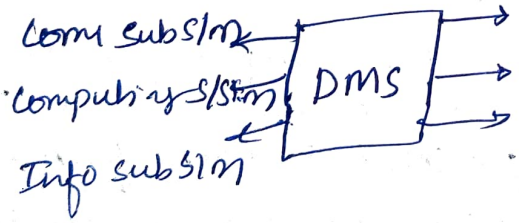


6b. DMS

A DMS is an integrated communication computing and information system that enables the processing management delevery and information system that enable the processing management delivary and presentation of synchronized multi media information that the quality of service generates.

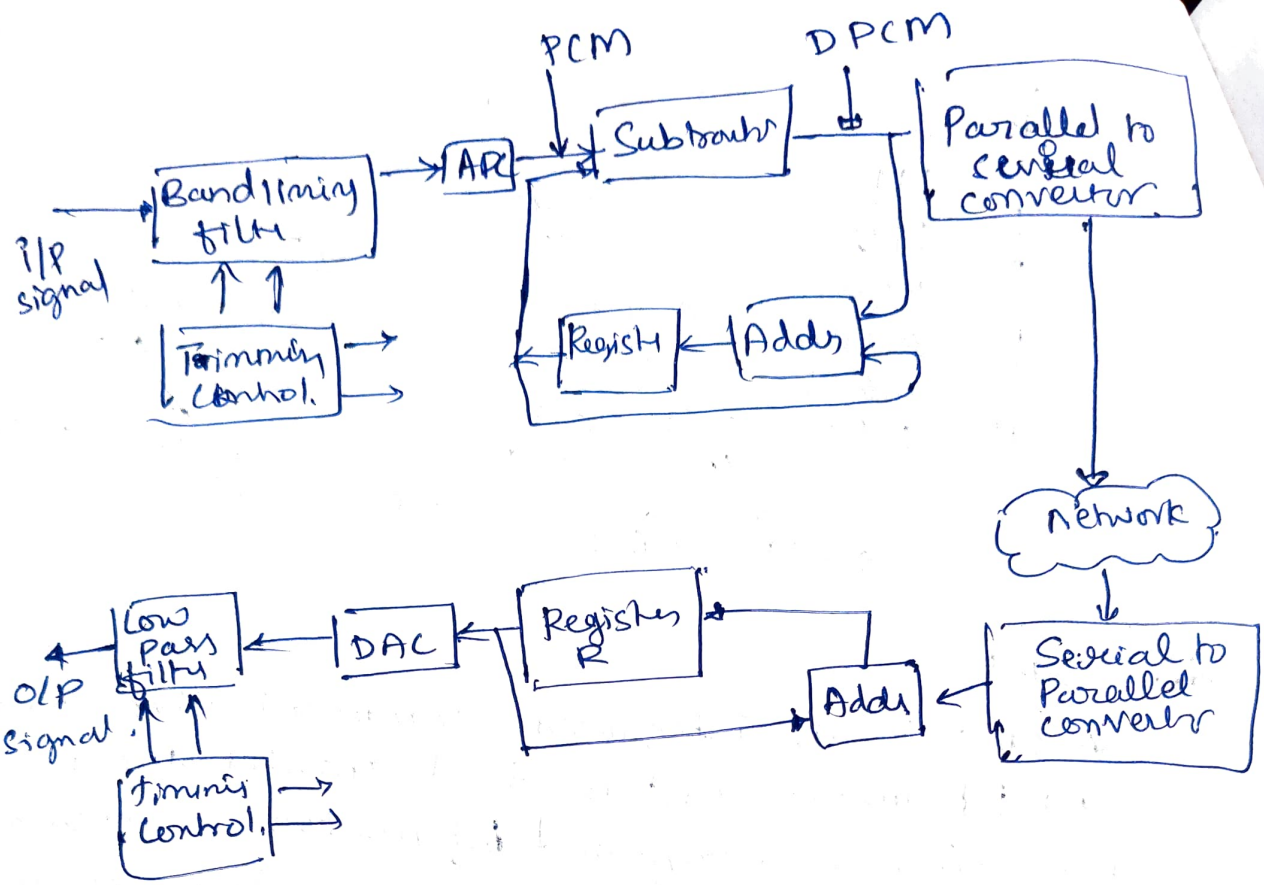
→ It integrate and manages the info. communication and computing subsystem to redize multimedia application.

→ The inputs of sub system consists of the factors that derive a DMS from concepts to reality and the output consist of a wide rang of distributed multimedia applicat.



7a. DPCM is a derivative of standard pcm and uses the fact that, for most audio signals the range of the difference in amplitude between successive samples of the audio waveform is less than the range of the actual sample amplitude.

Hence if only the digitized difference signal is used to encode the waveform then fewe bits over required.



A DPCM encoder and decoder are shown above. The previous digitized sample of the analog input signal is held in the register, and the difference signal is computed by subtracting the current content from the new digitized sample O/P. by ADC.

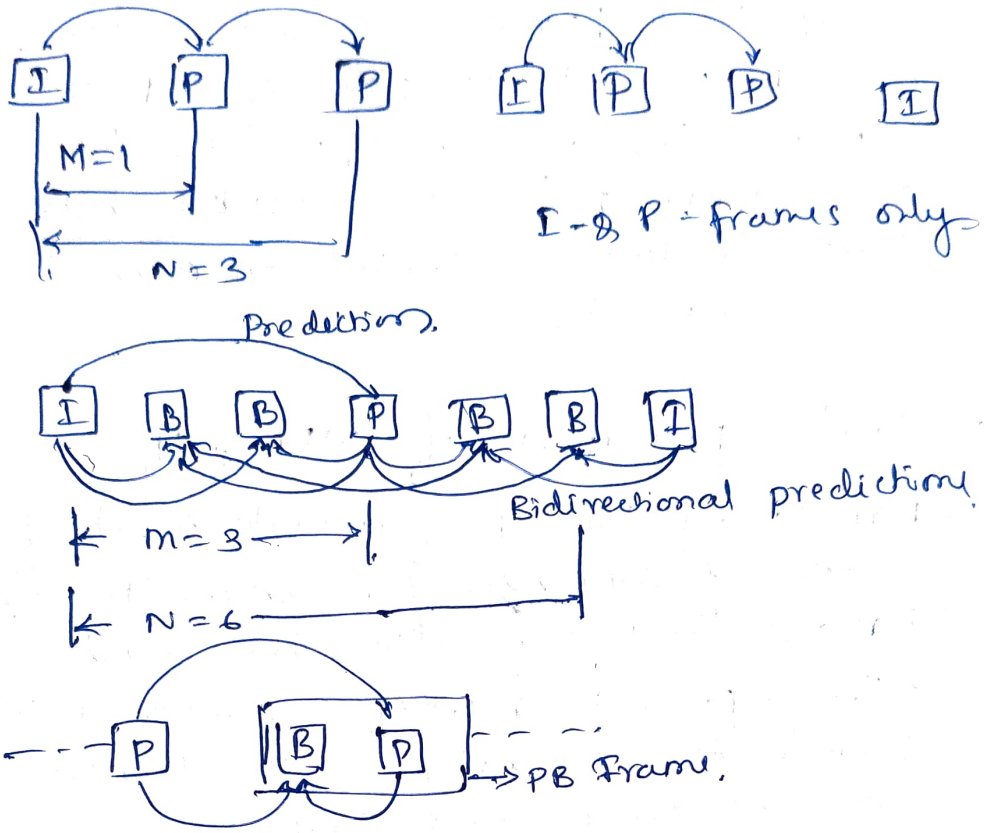
7b. Video Compression principles.

The quality of the video used in various applications varies and is determined by the digitized format & frame refresh rate used.

The digitized format defines the sampling rate that is used for the luminance Y and two chrominance Cb & Cr signals and their relative position in each frame.

One approach to compressing a video source is to apply the JPEG algorithm to each frame, independently it is known as JPEG or MJPEG.

B-frame: Motion Estimation involves comparing small segments of two consecutive frames for different and should a diff. be detected, a search is carried out to determine to which neighbouring segment, the the original segment has moved.



8a. H.261 Video encoder

→ The standard has been defined by the ITU-T for the provision of video telephony and video conferencing services over an ISDN.

The standard is also known as PX64 where P can be through 30.

The digitization format used is either the common intermediate format (CIF) or the QCIF. Normally, The CIF is used for video conferencing and QCIF for video telephony.

→ Each frame is divided into macroblocks of 16X16 pixels for compression, the horizontal resolution is reduced from 360 to 352 pixels to produce an integral number of 22 macroblocks.

Hence since both formats use subsampling of the two chrominance signals at half the rate used for the luminance signals, the spatial resolution of each format is.

CIF - $Y = 352 \times 288$, $C_b = C_r = 136 \times 144$

QCIF - $Y = 136 \times 144$ $C_b = C_r = 88 \times 72$

Only I - P. frame are used in H.261 which 3 - P. Frame between pair of I - frames,

→ The Encoding of each of the six 8×8 pixel blocks that make up each macroblock in both I- and P- frame 4 blocks for Y and one each for Cb and Cr is carried out.

8b. Coding principles of MPEG-4.

- Formed by ISO to formulate a set of standards relating to arrange of multimedia application that involve the use of video with sound,

→ The outcome is a set of 3 standards which relate to either the recording, or the transmission of integrated audio and video streams.

→ Each targeted at particular applications

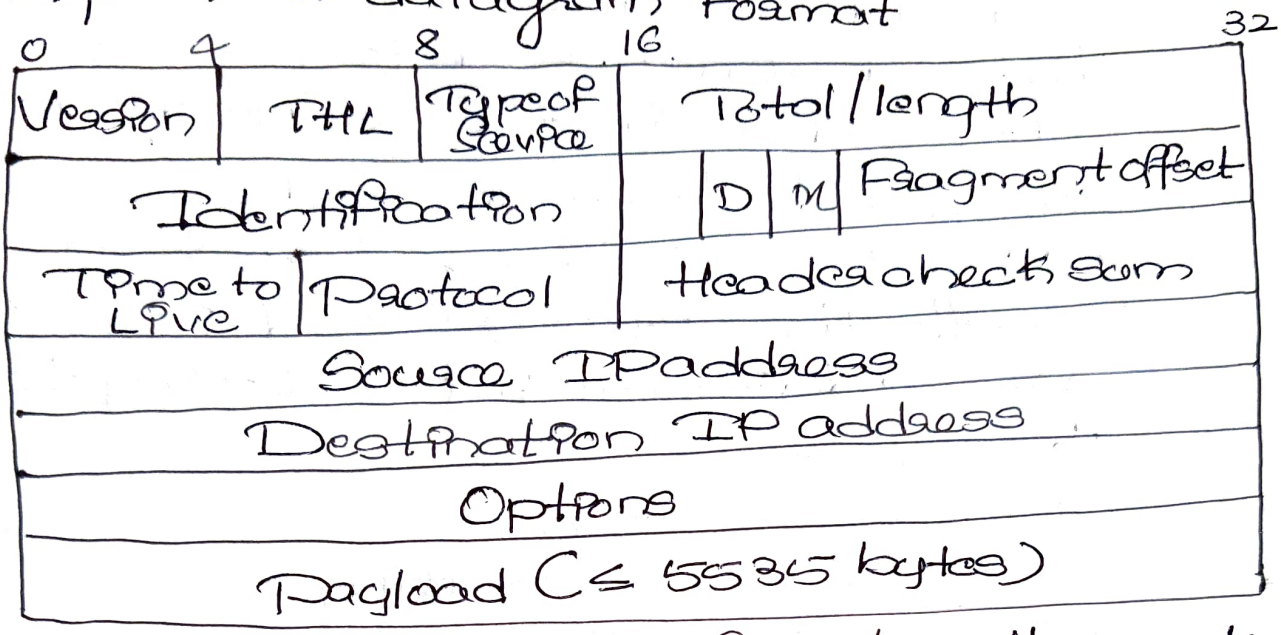
→ The 3 standards are MPEG-1, MPEG-2, MPEG-4,

MPEG-4 - The standard contains features to enables a user not only to passively access a video sequence but also to access and manipulate the individual elements that make up each scene within the sequence/media.

Because of its high coding efficiency with scenes like video telephone. standard is also used in low bit rate n/w for such applications. It is an alternative to the H.263 standard,

10a) Explain IP datagram Format

⇒



All user info is transferred in the payload part of what is known as a datagram
Version field contains the version of the IP used Intermediate header length field specifies the actual length of the header
The type of service field shows the priority of the application data.
The total length field defines the total length of the datagram
The next 3 bits are Flags. D Flag defines don't Fragment and M Flag defines more Fragment
The Fragment offset is used by the same Datagram to indicate the position of the last byte of the Fragment
The value in the time to live field defines the maximum time for which a packet can be in transit across the internet
The value in the protocol field is used to enable the destination IP to pass the payload within each received packet to

the same protocol that sent the data. The header of checksum applies just to the header part of datagram and is a safeguard against corrupted packets Source & destination addresses are IP addresses of source and destination Finally the options field is used to carry additional info relating to

1) Security
2) Source routing
3) Loose Source routing
4) Route recording
5) Stream Identification
6) time stamp

10b) Explain the devices commonly used in LAN

⇒ The common network devices used in LAN are

1) HUB ⇒ hubs connect multiple compete networking device together. A hub also acts as a Repeater It connects LAN components with identical protocol

2) SWITCH ⇒ A switch is multiport device that improves network efficiency The switch maintains limited routing info Segments of LANs are usually connected using switches Switches can read the MAC address to pass the packets to the appropriate destination A switch can look at either data link layer or the network layer of the network layer of OSI Model

3) Routers ⇒ Routers help transmit packets to their destinations by routing through networking devices using network topologies. They store info about the networks they are connected to using routing tables. Routers mainly work at network layer. Routers can also operate as packet filtering firewalls & use access control lists.

4) Bridge ⇒ Bridges are used to connect 2 or more host or network segments together. The basic role of bridges in network architecture is storing and forwarding frames between different segments. They use MAC addresses for transferring frames

5) Gateway ⇒ Gateways normally works at the transport and session layers of the OSI model. gateways connect two or more autonomous networks, each with its own routing algorithms protocols, topology, domain name service etc.

6) Modem ⇒ Modems are used to transmit digital signals over analog telephone lines modems do modulation and demodulation

7) Repeater ⇒ It is a device that regenerate the weak signals to regain their shape. They work on the physical layer

8) Access point ⇒ It is commonly a wireless device which operate as a bridge connecting a standard wired network to wireless devices.

They works at the data link layer of OSI Model

Wireless access point consists of a transmitter and receiver devices used to create a wireless LAN