Important Instructions to examiners:

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

Q. 1) a) Attempt any 3 **12 Marks**

i. (Each device with use – 1Mark).

Note: ***Any four input or output devices can be chosen from the list below with its use.***

- **Input devices**:

1. Electronic Pen with Digitizer:

Use: An electronic pen is used to write, draw, point to an object on the digitizer and the digitizer generates the pen position, pen status etc. to the system.

2. Scanner

Use: Scanner is used to scan the document/images to a computerized file, which can be saved and modified.

3. MIDI

- Use: Musical Instruments Digital Interface is an industry standard protocol used to enable electronic musical instruments (synthesizers, drum machines), computers and other electronic equipment (MIDI controllers, sound cards, samplers) to communicate and synchronize with each other.

4. Digital camera

- Use: A digital camera is the one that stores images digitally rather than recording them on a film.

5. Video Camera

Use: A video camera is used to record videos in the digital form, which can be saved and processed further.

6. Trackball

Use: Trackball is used to point to an object, items on the screen with the help of a ball similar to a mechanical mouse, except that the ball is on the upper surface.

7. Touch Screen

Use: This is a flat surface used to recognize the touch and perform actions.

- **Output devices**:

1. CRT monitor

Use: This is an output device used to display images on the screen using cathode ray tube.

2. Flat Panel display

Use: Flat panel displays include LCD(Liquid Crystal Displays), LED(Light Emitting Diodes), DLP (Digital Light processing) and Plasma panels used to display high resolution and high speed quality images.

3. Laser Printer

Use: Laser printers are used to print high quality, high resolution prints at a faster rate.

4. Dye Sublimation printer

Use: These printers are used to create a photographic quality print in multimedia applications.

ii. QOS architecture: (Each type – 2 Marks)

QOS (quality of service) is used in OSI reference model to allow service users to communicate with network service regarding data transmission requirements. The two approaches to provide QOS guarantees in high speed networks are:

1. **Tightly controlled-** The traffic patterns of a stream are preserved at each switching point in the network. This simplifies computation of performance bounds for admission tests, but a queuing discipline can be complex to implement and the network can be significantly utilized.
2. **Bounding-** A bound {statistical or fixed) is specified for traffic on the edge of the network. Bounds are recomputed for each session along the route of the session. Issues in the use of this approach include the tightness of the resulting bounds and the extent to which traffic can be modeled by the statistical bounds.

iii. Image Display Issues: (Each issue – 1Mark.)

Images are stored in compressed form. Images scanned by high-quality scanners are scanned at 400 pixels/ inch or higher resolutions. A typical image at this resolution requires a screen resolution of 400 pixels/inch or approximately 3600 × 4400 pixels. Since most monitors for computer use are limited to 1280 × 1024, the image is scaled down by a factor of 12 to 20 for display.

Scaling: Image scaling is performed on the fly after decompression. The image is scaled to fit in a user-(or application) defined window at the full pixel rate for the window. In other words, if the image is scanned at 3600 × 4400 pixels and the full resolution for the window is only 600 × 440, the image is being scaled by a factor of 6 ×10 that is 60 times. This factor is changed as the window size is changed. This factor will also be different for the same window size for higher-resolution monitors.

Zooming: Zooming allows the user to see more detail for a specific area of the image. For example, zooming helps in seeing greater detail about a picture, reading dollar amounts in a form, or even checking a signature. At full resolution of 3600 × 4400, a small window of 1.5 inches × 1 inch out of a standard 8.5 inch × 11 inch document can be seen at full resolution in a 600 × 400 pixel window. In effect, the zoom factor is 60. Users can zoom by defining a zoom factor(e.g., 2:1, 5:1 or 10:1). These are set up as preselected zoom values.

Rubber Banding: This is another form of zooming. In this case the user can use a mouse to define two corners of a rectangle. The selected area can be copied to the clipboard, cut, moved or zoomed.

Panning: Panning implies that the image window is unable to display the full image at the selected resolution for display. In that case the image can be panned left to right or right to left as well as top to bottom or bottom to top. Panning is useful for finding detail that is not visible in the full image.

iv. MPEG Architecture: (Exp. 2 Marks, Diag. 2 Marks)

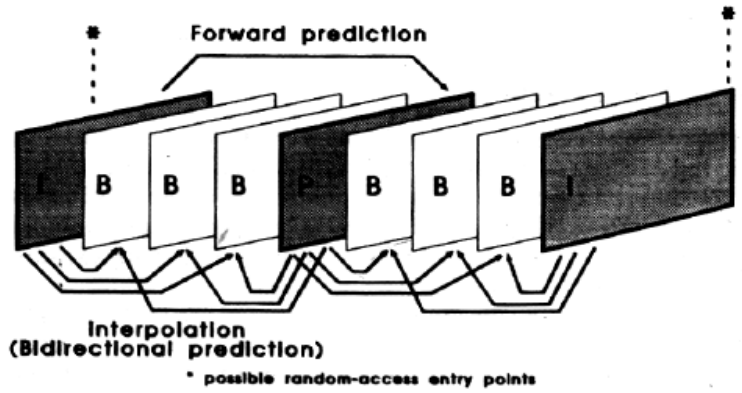
The MPEG standard is primarily a bit stream specification, although it also specifies a typical decoding process to assist in interpreting the bit stream specification. The bit stream architecture is based on a sequence of pictures, each of which contains the data needed to create a single displayable image. Also the order of transmission of pictures in the data stream may not be the same as the order in which pictures will be displayed.

There are four different kinds of pictures, depending on how each picture is to be decoded:

I pictures are Intra coded, meaning that they are coded independent of any other picture. An I picture must exist at the start of any video stream and also at any random-access entry point in the stream..

P pictures are predicted pictures, which are coded using motion compensation from a previous I or P picture. A P picture requires about one-third of the data of an I picture;

B pictures are interpolated pictures, which are coded by Interpolating between a previous and a future I or P picture. This process Is sometimes referred to as bidirectional prediction. A B picture takes 2:1 to 5:1 less data than a P picture; the most compression is obtained by using as many B pictures as possible.



This picture sequence is diagrammed in Figure showing the dependencies of pictures on each other. The standard, however, is completely flexible with regard to the picture sequence, and an application can (if It wishes) tailor it to optimize any situation.

When B pictures are used, the reference I and P pictures must be transmitted before any dependent B pictures. This means that the order of transmission for the sequence above is (the numbers are still the order of display)

IPBBBIBBBPBBB…….

1523496781310111213…….

Q. 1. b) Attempt any One: **(6 Marks)**

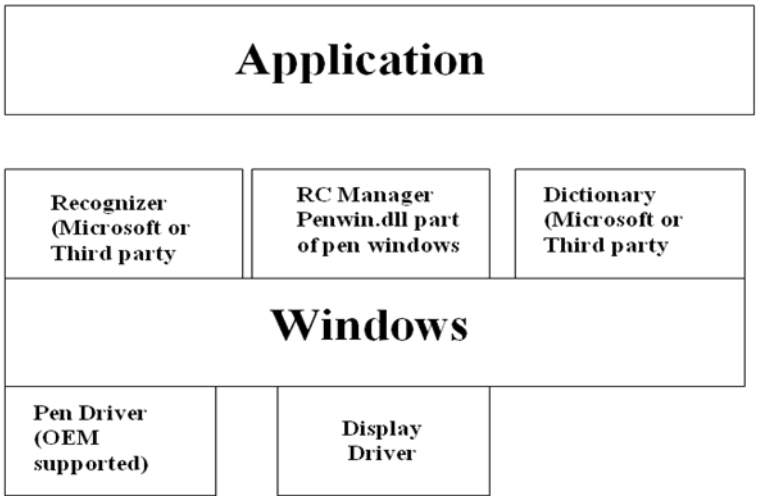
i) Electronic pen: **(Diagram – 2 Marks ; Explanation:2 Marks)**

- A digital pen provides a medium for user input and for manipulating the applications.
- A digital pen is powerful I/P device that allows the user to write, draw, point and another user interface called gestures.
- Gestures allows user to select an object and act upon object by making a stroke or loop with the pen.
- Gestures are used for entering characters and for writing notes on the screen of a pen based system.
- The pen is used to point, pick and drag, click in a place of mouse.

Operation of Electronic Pen

- The working of electronic pen is best explained by the Microsoft Windows For Pen Computing System.
- It is also called Pen Extension for Windows.
- The pen Extension include a set of dynamic link libraries and drivers that make applications pen enabled.
- The DLL allow pen based I/P and handwriting recognition.

The Microsoft Windows for pen computing system



Components of a Pen Computing System

Electronic pen and digitizer : The digitizer generates the pen position(x & y co-ordinates) and the pen status (distance from the screen surface and pen contact with the screen)

Pen driver : A device driver that collects all a pen information and builds pen packets for the recognition context manager (RC manager).

Recognition Context Manager(RC Manager) :The manager is the heart of the pen system. It works with device driver, recognizer, dictionary and application to perform the recognition and the requested task.

Recognizer:- Recognizes handwritten characters and converts them to ASCII

Dictionary:- The recognizer feeds the characters to dictionary system, which selects the most likely character string combinations in the form of words

Display driver:- It renders the objects on the screen.

ii) Describe in short:

1. CD-ROM : CD ROM **(Any four points - ½ Mark each.)**

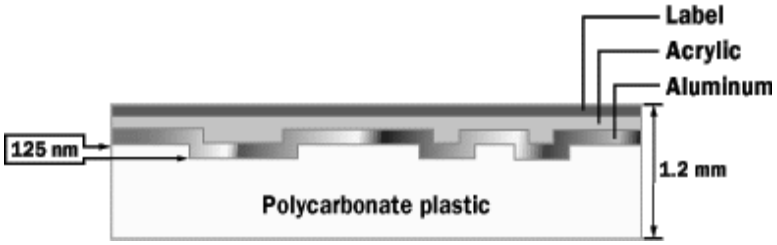
Note: ***Either construction/principle of operation may be considered along with features/advantages.***

Features

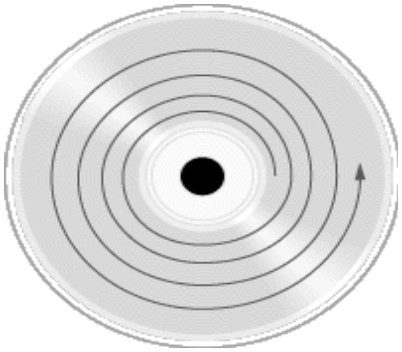
- Ease of use & durability of media
- Random access capabilities
- Very high sound fidelity
- High storage volume

Physical construction of a CD ROM

- Polycarbonate disc 120mm in diameter,1.2mm thickness & 1.5mm spindle hole
- Polycarbonate disc contains lands & pits
- Each pit 100nm depth & 500nm in width
- The space between the two adjacent pits is called land
- Pits represent binary zero & transition from land to pit & pit to land is represented by binary one.
- Polycarbonate substance covered by reflective aluminum
- Reflective aluminum is protected by coat of lacquer to prevent oxidation



- Consists of a single track which starts from the centre from inside & spirals outside.



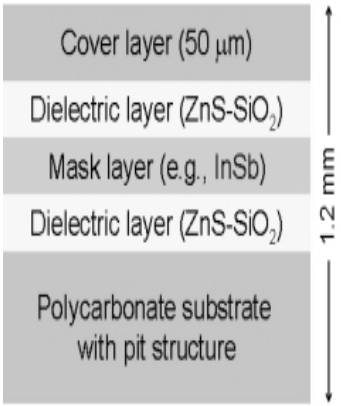
- The data is recorded on the tracks as lands & pits
- A single track divided into equal length sectors or blocks
- Each block consists of 2352bytes also called a frame
- 75 frames per second in an audio CD

2. WORM : Optical drives **(Any four points - ½ Mark each).**

Note: ***Either construction/principle of operation may be considered along with features/advantages*****.**

- Write Once Read Many records data using high power laser beams
- Pits are created. Once written cannot be erased
- Once the disk is full, it becomes ROM
- Used in applications where data once written is not altered or deleted mistakenly, but, the data can be edited. When new data is written, the old data is marked logically deleted.

- Structure :--
  - Six layers
    - Polycarbonates substance
    - Next three multiple recording layers made up of ..antimony-selenide
    - Bismuth-tellurium
    - Again antimony-selenide
    - Recording layers covered by alluminuim alloy or gold for the reflectivity
    - The reflective layer is coated by lacquer to prevent oxidation

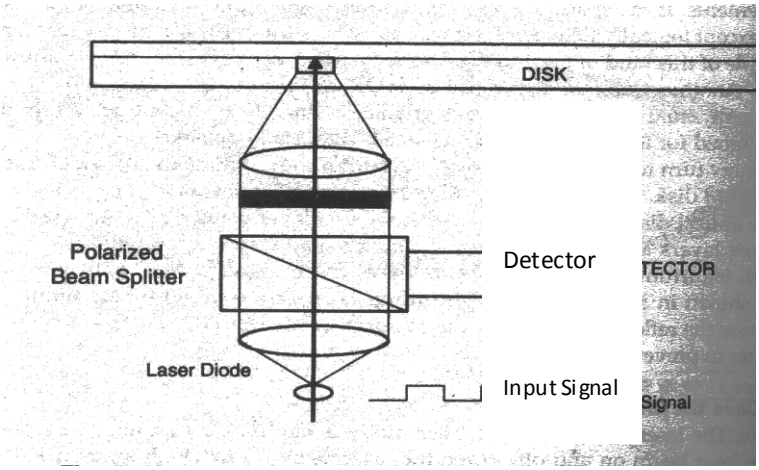


Data Recording

- Input signal is fed to a laser diode
- Laser beam is modulated by the input signal.. Switches it on or off
- When ON, strikes the three recording layers
- Absorbed by bismuth-tellurium & heat is generated
- This is the recorded area

Data Reading

- Weaker laser beam is focused onto the disk
- Laser beam reflected back
- Beam splitter mirror & lens arrangement sends the reflected beam to the photo detector
- Photo sensor converts it into electrical signal



3. RAID: **(Any four points - ½ Mark each.)**

Note: ***Any 3 RAID level can be described in short.***

RAID (Redundant Array of Inexpensive Disks)

- Array of multiple disks.
- Combines throughput speed & reliability.
- Data is spread to achieve fault tolerance, large storage capacity and performance improvement.
- Cost saved.
- Many small disk drives with a single controller.
- The different RAID techniques are,

RAID 0 (Disk striping): Multiple drives (minimum 2 drives) connected to single disk controller.

- Data written to disk is broken into segments.
- Excellent for small chunks.

RAID 1 (Disk mirroring)

- Data not only striped across multiple drives, but also mirrored.
- Two copies of every file to be written on two separate drives.
- Each main drive has a mirror drive, connected to single controller.
- Data is written at the same time.
- Complete data redundancy.

RAID 2 (bit interleaving of data)

- Arrays of multiple drives.
- Bit-interleaving is used to detect and correct errors.
- No. of bits depend upon the error correction algorithm.

- Ability to handle very large files.
- Data recovered if one data drive fails, but cannot be recovered if one data drive and one error correction drive fails.
- Good for multimedia systems.

RAID 4 and RAID 5 are used for Sector interleaving of data with dedicated parity drive and block interleaving of data.

Q.2 Attempt any four: **(16 Marks)**

a) **Synchronization** **(Each point – 1 mark.)**

Note: ***Any four points on synchronization and four points in orchestration can be considered. Orchestration Layer diagram (1Mark)can also be considered.***

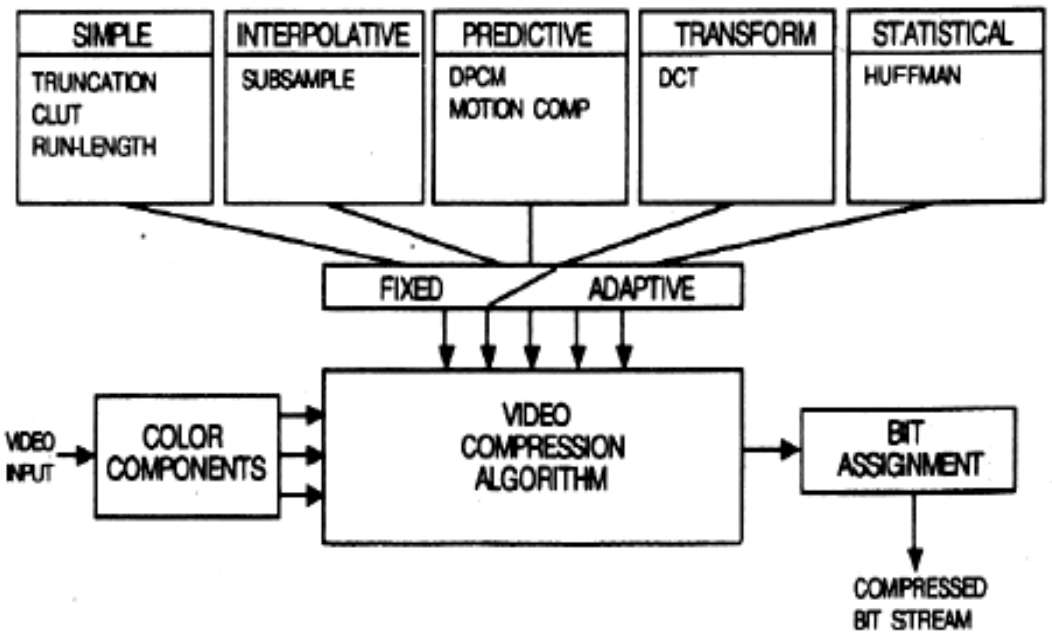
1. Synchronization is the co-coordinated ordering of events in time.
2. The time sampled nature of digital video and video referred as isochronous data, requires that delay and jitter be tightly bounded from the point of generation or retrieval to the point of presentation. This requirement is referred as **intra-media synchronization**.
3. If several continuous media streams are presented in parallel, potentially from different points of generation or retrieval, constraints on their relative time relationships are referred to as **inter-media synchronization**.
4. A fundamental requirement for multimedia systems is to provide inter-media and intra-media synchronization.
5. The intermediate subsystems involved in delivering a stream may introduce delay, jitter, and errors. These values are cumulative along any path. So, it is the cumulative delay, jitter, and error rate that must be managed to achieve the end-to-end QOS requirements.
6. Various mechanisms and formalism for synchronization have been developed, ranging from low-level hardware-based techniques to abstractions for concurrent programming languages.
7. Variation in delay between corresponding elements of two or more synchronized media objects is referred to as ***skew***. Skew results when errors or a delay in one media stream prevents the system from meeting the presentation schedule for that stream. When skew exceeds the application's skew tolerance, then the streams must be resynchronized. Techniques for allowing the slow stream catch up (e.g. skipping) or delaying the fast streams can be used but the result must meet the applications requirement.

Orchestration or Meta Scheduling

1. Orchestration –The management of collection of resource managers to achieve end to end synchronization is referred to as orchestration.
2. QOS parameters are considered to be a basic tool in orchestration.
3. The definition of QOS parameters which permit system wide orchestration is referred as QOS architecture.

4. Each resource manager includes a scheduling function which orders the current request for servicing so as to meet the required performance bounds.
5. The orchestration layer provides overall synchronization and scheduling functions as required by the application.

b. Video compression technique : (Block Diagram – 2 Marks; Any one technique :2 Marks)



Simple Compression techniques:

In **simple** compression technique, Truncation, CLUT and Run length methods are used.

Truncation : In truncation, data is reduced by lowering the number of bits per pixel. This is done by removing away some of the least significant bits for every pixel. If truncation removes major information pixel then contouring occurs, and the image will start looking like a cartoon. However, many images can stand this up to a point; so, it is possible to truncate to 16 bpp with good results on real images. 16 bpp is usually done by assigning bits to color components such as R:G:B 5:5:5 or Y:V:U 6:5:5 instead of using 8:8:8 bpp. In the R:G:B 5:5:5 case, the. 16th bit could be used as a flag for some other purpose, such as a keying signal.

CLUT :Color **L**ook**U**p **T**able

This technique creates a different kind of artifact, is the color lookup table (CLUT) approach. With a CLUT, the pixel values in the bitmap represent an index into a table of colors, but the table of colors will have much greater bpp than the pixel values. It is usually done with pixels having no more than 8 bpp, which means that the entire picture must be reproduced with 256 or fewer colors at a time. The colors in the CLUT are chosen from a palette represented by the color depth in the lookup table.

In this technique each image must be processed ahead of time to choose the 256 best colors for that Image (a unique CLUT must be created for. each image), and that is a nontrivial amount of preprocessing. Going higher than 8bpp with CLUT (more colors) will give better results.

Run Length Encoding – RLE

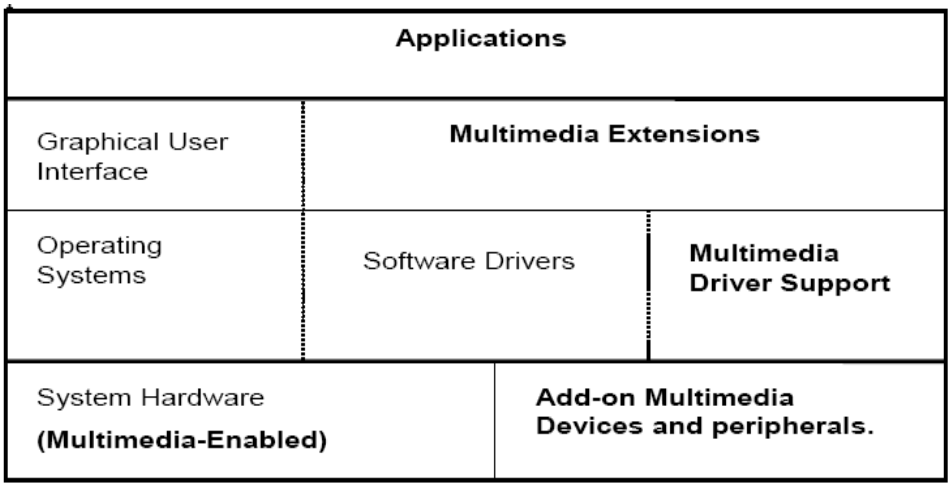
In this technique, blocks of repeated pixels are replaced with a single value and a count of how many times to repeat that value.

It works well on images which have areas of solid colors—for example, computer-generated images, cartoons, or CLUT images. Depending entirely on the kind of image, RL coding can achieve large amount of compression , but effectiveness is limited to image that contain large amount of repeated values.

c. **Multimedia System Architecture** (**Diagram – 2 Marks, Explanation – 2 Marks.)**

1. Multimedia includes a large variety of technologies and integration of multiple architecture interacting in real time.
2. All these multimedia capabilities must integrate with the standard interfaces.
3. Multimedia subsystems should be designed such that systems can operate with or without special hardware, and with no changes in the application software.
4. Application should require no change for wide variety of hardware, for this interface standards are necessary, which are called device –independent Application Programming Interface (API).
5. Common file formats allow data files to be exchanged between different hardware architectures and operating environments.
6. Through APIs applications support a large number of drivers.
7. Through common APIs, application developers develop applications that can work with hardware drivers as well as software drivers.
8. The figure shows the architecture of the multimedia workstation environment is shown.

9.



10. In this architecture, the left side is very similar to non-multimedia systems and right side shows the new architectural entities required for supporting multimedia applications.
11. The add-on multimedia devices and peripherals include scanners, video cameras, VCR's and sound equipment along with their associated devices controllers and encoding hardware such as DVI-JPEG or MPEG enabled boards.
12. For each of these special devices, a software device driver is needed to provide the interface for an application to the device.
13. The graphical user interface, designed primarily for windows managed by applications at fixed resolution require control extensions to support applications such as full motion video or remote Desktop
14. Multimedia operation places tremendous demands on the system hardware, in terms of both computing performance and storage.
15. High resolution display technologies allow multiple applications to be operational at one time thereby requiring additional resources to manage program and data requirements.

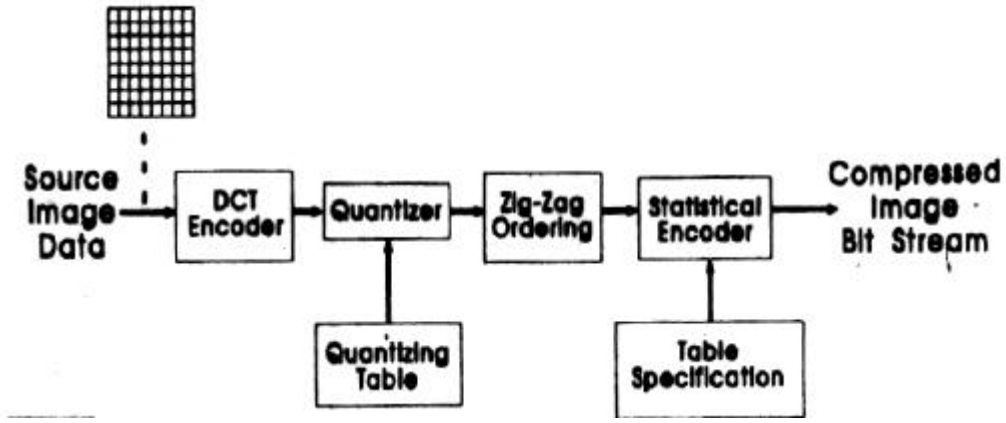
d. Data processing server – (2 Marks; Video Server – 2 Marks.)

Data Processing servers are traditional database servers that contain alphanumeric data. In a relational database, data fields are stored in columns in a table. In an object-oriented database, these fields become attributes of the object. In either case, indexing some fields or attributes is essential for fast access to data. The databases are designed for rapid searches of objects using one of the indexed fields or attributes. The database serves the purpose of organizing the data and providing rapid indexed access to it. The database management system can interpret the contents of any column or attribute for performing a search.

Video servers are designed to manage very large objects. Besides providing the usual indexing functions, video servers are made intelligent to support the isochronous playback requirements for video objects by reserving network bandwidth for example, in an ATM network this is achieved by reserving cells.

Generally, wherever possible, separate servers for different object types are recommended this not only improves performance, but it also makes server management easier. It is good practice to dedicate specialized servers for multimedia objects such as image and video.

e. DCT Encoding & Quantization: (Diagram – 2 Marks ; Explanation:2 Marks)



Discrete Cosine Transform:

- DCT is closely related to Fourier transforms.
- Fourier transforms are used to represent a two-dimensional sound signal.
- The sound signal, when projected on a graph, consists of amplitude on the y-axis and frequency on the x-axis.
- When represented in this manner, the signal consists of a large number of data points.
- However using Fourier transforms, it can be used to a series of equations that represent sine waves and harmonics of sine waves which when added up at each point, form the contour/group of the audio signal on the graph.
- DCT uses a similar concept to reduce the gray-scale level or color signal amplitudes to equation that require very few points to locate the amplitude.

DCT Coefficients

- Each 8 x 8 block (16 x 16 is also used) of image sample is effectively a 64-point discrete signal which is a function of two spatial dimensions x and y.
- If this signal is decomposed into 64 orthogonal basis signals, each of these 64 signals will contain one of the 64 unique two-dimensional spatial frequencies which makeup the input signal's spectrum.

- The output amplitudes of the set of 64orthogonal basis signals called DCT coefficients. In other word the value of each DCT coefficient is uniquely defined by the particular 64-point input signal, and can be regarded as the relative amount of the 2D spatial frequencies contained in the 64-point input signal.
- The coefficient with zero frequency in both dimensions is called the DC coefficient, and the remaining ones are called AC coefficients.

Quantization:

Quantization is a process that attempts to determine what information can be safely discarded without a significant loss in visual fidelity. It uses DCT coefficients and provides many into one mapping. The quantization process is fundamentally loss due to its many-to-one mapping.

Dequantization:

This process is the reverse of Quantization used a many to one mapping, The information lost in that mapping cannot be fully recovered.

f. Navigation methods for information access: (Each Method – 1 Mark.)

Access structures define the ways objects can be accessed and how a navigation takes place through the information objects.

The following describes common forms of navigation for information access.

1. **Direct:**

- Direct information access requires that the user have knowledge of the specific object that needs to be accessed.
- This allows the playback server application to directly access the video object; the user does not have to search for it.

2. **Indexed :**

- If the object id of the object is an index entry that resolves to a filename on a specific server and disk partition, then the information access mechanism is an indexed mechanism.
- Indexed access is beneficial in that it abstracts the real object from the access to the object. That is, the object id may resolve to one of several different copies of the same video object on several video servers.

3. **Random Selection:**

- In this form of information access, the user can pick one of several possible items.
- The items are not necessarily arranged in any logical sequence; nor are they displayed sequentially.
- This is useful if the user has very little information and must browse through the information.

4. **Browsing :**

- Browsing is useful when the user does not have enough knowledge about the object to access it directly.

Q.3) Attempt any four: (16 Marks)

a) Describe line tool to draw line with example, also define how colour and width can be changed of line. (3-marks for steps and 1 mark for colour and width)

Ans : To draw one straight line segment at a time, use the Line tool.

1. Select the Line tool .
2. Select Window > Properties and select stroke attributes.

   Note:

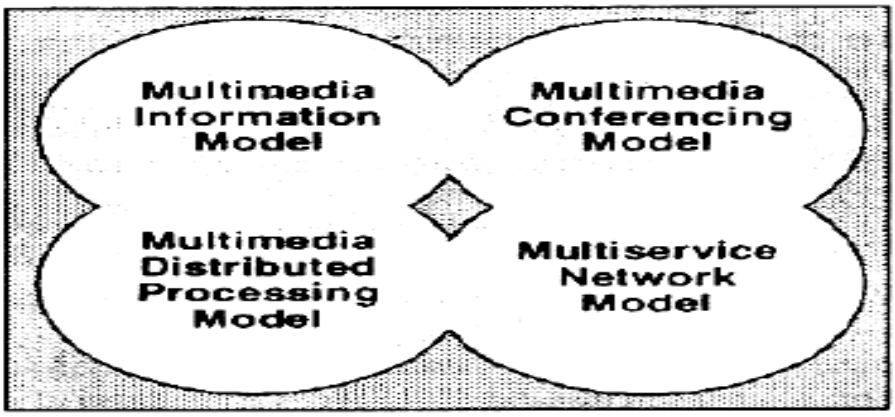
   You cannot set fill attributes for the Line tool.

3. Click the Object Drawing button in the Options section of the Tools panel to select either Merge or Object Drawing mode. When the Object Drawing button is depressed, the Line tool is in Object Drawing mode.
4. Position the pointer where the line is to begin, and drag to where the line is to end. To constrain the angle of the line to multiples of 45°, Shift-drag.
5. From the colour picker pick the colour and the width of the line.

b) Explain multimedia framework with diagram.(4 marks – 1 mark for point any three and 1 mark for diagram)

1. A multimedia framework is a software framework that handles media on a computer and through a network.
2. A good multimedia framework offers an intuitive API and a modular architecture to easily add support for new audio, video and container formats and transmission protocols.
3. It is meant to be used by applications such as media players and audio or video editors, but can also be used to build videoconferencing applications, media converters and other multimedia tools.
4. In contrast to function libraries, a multimedia framework provides a run time environment for the media processing.
5. An environment provides execution contexts for the media processing blocks separated from the application using the framework.

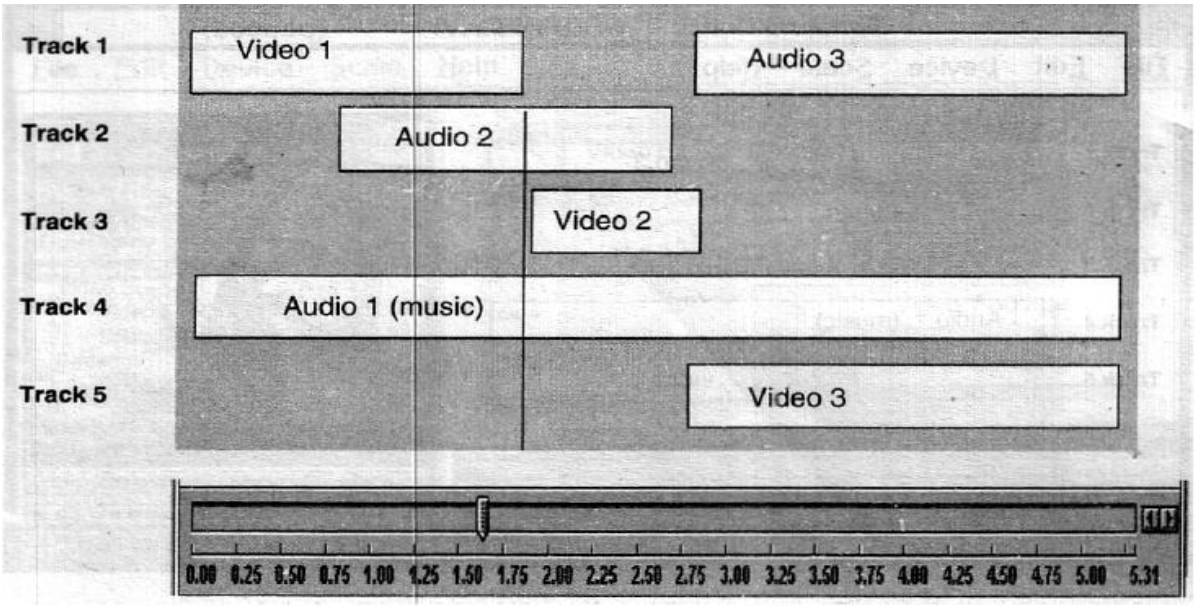
6. The separation supports the independent processing of multimedia data in a timely manner. These separate contexts can be implemented as threads.



The framework consists of four interrelated models. The information and distributed processing models constitute the Multimedia Information System (MMIS). The conferencing and multiservice network models form the Multimedia Communications System (MCS).

c) **Time Line Based Authoring Systems** (Diagram 2 Marks, description-2Marks)

- In a timeline-based authoring system, objects are placed along a time line.
- The timeline can be drawn on the screen in a window in a graphic manner, or it created using a script in a manner similar to a project plan.
- In either case, the user must specify a resource object and position it in the timeline.
- On playback, the object starts playing at that point in the timescale.
- Figure shows a model for a timeline-based authoring interface.



- Once the multimedia object has been captured in a timeline, it is fixed in location and cannot be manipulated easily.
- a single timeline causes a loss of information about the relative time-lines for each individual object. The information about the change from one scene to the next for example is lost.
- Editing a component causes all objects in the timeline to be reassigned because the positions of objects are not fixed in time, only in sequence.
- Copying portions of the timeline becomes difficult because it is used to predict the start of a new section.

d) RIFF and AVI file format. (any two points for each – 1 mark each)

1. Resource Interchange File Format (RIFF) is a generic file container format for storing data in tagged chunks..
2. RIFF files consist entirely of "chunks".
3. The overall format is identical to IFF, except for the endianness as previously stated, and the different meaning of the chunk names.

All chunks have the following format:

- 4 bytes: an ASCII identifier for this chunk (examples are "fmt " and "data"; note the space in "fmt ").
- 4 bytes: an unsigned, little-endian 32-bit integer with the length of this chunk (except this field itself and the chunk identifier).

- variable-sized field: the chunk data itself, of the size given in the previous field.
- a pad byte, if the chunk's length is not even.

4. Two chunk identifiers, "RIFF" and "LIST", introduce a chunk that can contain subchunks.
5. The RIFF and LIST chunk data (appearing after the identifier and length) has the following format:

- bytes: an 4 ASCII identifier for this particular RIFF or LIST chunk (for RIFF in the typical case, these 4 bytes describe the content of the entire file, such as "AVI " or "WAVE").rest of data: subchunks.

1. Audio Video Interleaved (also Audio Video Interleave), known by its initials AVI, is a multimedia container format.
2. AVI is a derivative of the Resource Interchange File Format (RIFF), which divides a file's data into blocks, or "chunks." Each "chunk" is identified by a FourCC tag.
3. An AVI file takes the form of a single chunk in a RIFF formatted file, which is then subdivided into two mandatory "chunks" and one optional "chunk".
4. The first sub-chunk is identified by the "hdrl" tag.
5. This sub-chunk is the file header and contains metadata about the video, such as its width, height and frame rate. The second sub-chunk is identified by the "movi" tag.
6. This chunk contains the actual audio/visual data that make up the AVI movie. The third optional sub-chunk is identified by the "idx1" tag which indexes the offsets of the data chunks within the file.

e) What is the use of Lasso tool? (1 mark each for explanation – 1 mark for symbol)

1. The Lasso Tool is a free selection tool that lets you draw your own selection outlines instead of clicking by shape or using the default dragged-square selection outline created by the Arrow Tool.
2. With the Lasso Tool you can click and then drag to draw any shape selection that you want; if you release the mouse, the shape will automatically close itself by connecting the open ends with a line, or you can connect the ends yourself by dragging all the way to your starting point.
3. You can use the default tool for a rather "wiggly" selection, or you can use one of the three options at the bottom of the toolbar to help refine your selection.

Q. 4) a) Attempt any three: (12 Marks)

i. list of guidelines – (1 Mark; explanation -3 Marks)

Developing a user interface is not a simple task. There is never a "correct" UI; A UI can be good or bad. The correctness of a user interface is a perception of a user. Different users have different perceptions of what is correct.

- But a good user interface can be designed by following some structured design guidelines, as follows:
    1. Planning the overall structure of the application
    2. Planning the content of the application
    3. Planning the interactive behavior
    4. Planning the look and feel of the application
- A good user interface is defined as one that is perceived to be efficient and intuitive by most users. It is easy to learn and guides the user along by prompting actions. The user interface should be responsive to user needs.
- It should be quite obvious that planning the overall application is essential for ensuring that the user interface covers all features of the application and that these features follow in a logical sequence.
- The interactive behavior of the application determines how the user interacts with the application. A number of issues, including the following, are determined at this level:
    - Application-designed sequence of operations depicted by graying or enabling specific menu items
    - Active icons that perform ad hoc tasks (such as intermediate save of work in progress)

- The look and feel of the application depends on a combination of the metaphor being used to simulate real-life interfaces (e.g., VCR), Windows guidelines, ease of use, and aesthetic appeal. An elegant application has a consistent look and feel. For example, the same buttons are found in the same location in each dialog box, the functions of the icon toolbar are consistent, and so on. The look and feel is carried through to other applications that may be used in combination to act on a group of data objects (or compound object).

ii) Create Shape in Flash: (3 Marks explanation, 1 Mark Example)

1. A shape on the stage can be made up of a stroke object, a fill object, or combinations of the two.
2. Use the drawing tools in the Tools panel (shown at left) to create and change vector shapes on stage.
3. Many of the drawing tools have options which can be set in the Options area at the bottom of the tools panel. Others have options which can be set in the Properties panel.
4. When you use the pencil tool, for example, you create a stroke object.

5. The ink bottle, line, and pen tools also produce stroke objects (though the pen tool will also create a fill object if it is used to make a closed shape).

6. The paint bucket tool is used to create a fill object -- a filled area within a predefined stroke. The oval and rectangle tools can be used to produce strokes, fills, or both, depending on how the stroke color and fill color boxes are set.

Example

The **rectangle and oval** tools are for dragging out a rectangle, square (shift-drag), oval, circle (shift-drag), polygon, or star on stage, using the currently selected fill and stroke colors. Use option-drag (PC: alt-drag) to drag from the center.

Q. **4 a) iii)** **(**Any four points may be considered, each carrying 1 Mark.)

Benefits of compression:

1. Compression is the key to the future expansion of the web; it's certainly the key to the increasingly use of multimedia and 3-D technology.

2.When multimedia data objects like binary document images, grey – scale images, color images, photographic or video images, animated images, full – motion video etc are digitized, large volume of data are generated, the size of which can be reduced due to compression.

3.Since every bit incurs a cost when stored, retrieved, transmitted and displayed, the cost of the file is reduced.

4. The data objects requires a very large amount of data storage due to which the access time for retrieving data increases, using compression the access time is reduced.

5. In order to manage large multimedia data objects efficiently, these data objects need to be compressed to reduce the file size for the storage of these objects.

6. The goal of data compression is to represent an information source as accurately as possible using the fewest number of bits, thus accuracy is also maintained.

7. Ultimately using compression techniques the data is compressed which becomes easy to store, cost is reduced to store the large data.

Q. 4 a) iv) Describe dedicated multimedia authoring system.(1- mark each = 4 marks)

1. Dedicated authoring systems are designed for a single user and generally for single streams.
2. Designing this type of authoring system is simple, but if it should be capable of combining even two object streams, it becomes complex.

3. The authoring is performed on objects captured by the local video camera and image scanner or an objects stored in some form of multimedia object library.
4. Users need not to be experts in multimedia or a professional artist.
5. A structured design approach will be useful in isolating the visual and procedural design component.

4 b) Attempt any one: (6 Marks)

i) **(** List –1Mark; Explanation – Any 5 component (any two points explanation) – 1Mark each)

(Note: Have not given explanation; examiner can consider the answer based on the side headings)

- Distributed multimedia system is a multi-user system designed to support multimedia applications for a large number of users consists of a number of system components.
- Each system component serves a dedicated function and can be optimized for that function.

Components

A typical multimedia application environment consists of following components

1. Application Software
2. Container Object Store
3. Image and Still video store
4. Audio and video component store
5. Object Directory service agent
6. Component service agent
7. User Interface service agent
8. Networks (LAN & WAN)

1. Application Software

The Application software is the multimedia application that creates, edits, or renders multimedia objects. The basic tasks combined to form an application include the following,

- Object selection – The user selects a database record or a hypermedia document from a file system, database management system or document server.
- Object retrieval – In this task, the application retrieves the base object. The base object may be displayed or opened based on the nature of application. Within the display of object, some buttons allow the user to display or playback associated multimedia objects.
- Object component display – Some document components are displayed automatically when the user moves the pointer to the field or button associated with it.

- User initiated display- Some document components require user to click on the button for video object to bring upon the screen that simulates VCR controls.
- Object display management and editing

2. Document Store
   - Large storage of volumes of documents
   - Primary document storage
   - Linked object storage
   - Linked object management
3. Image & still video stores

   Characteristics

   - Compressed Information
   - Multi-image documents
   - Related Annotations
   - Large volumes
   - Migration
4. Audio & full motion video store

Characteristics

- Large capacity file system
- Temporary – permanent storage
- Migration
- Playback isochronicity
- Multiple shared access

5. Object Directory Service Agent

Services provided

- Directory service
- Object assignment
- Object status management
- Directory service domains
- Directory service server elements
- Network Access

6. Component Service Agent

Characteristics & Services provided

- Object creation service
- Playback service
- Component object service agent
- Service agents on servers
- Multifaceted services

7. User Interface Service Agent

Services provided

- Windows management
- Object creation and capture
- Object display and playback
- Services on workstations
- Using display software

8.Multi-server Network Topologies

- Multiple servers for different classes of information objects
- No. of topologies include
- Traditional LANs (Ethernet or Token Ring)
- Extended LANs (using hubs, switches & routers)
- High speed LANs (ATM and FDDI II)
- WANs (Including LANs, dial-up links, using ISDN, T1 and T3 lines etc.)

Q. 4. B) ii) State four topologies used for multi-server network.(any four – 1-1/2 mark each)

1. Point-to-Point Network Topology
2. Bus Network Topology
3. Star Network Topology
4. Ring Network Topology
5. Mesh Network Topology
6. Fully Connected
7. Partially Connected .

8. Tree Network Topology

Q.5) Attempt any 4 **16 Marks**

a) Middleware and list functions related to distributed computing. (Definition 2 Marks, Exp. 2 Marks)

The primary role of middleware is to link back-end database server to front-end clients in a highly flexible and loosely connected network model. Middleware provides the glue for dynamically redirecting client requests to appropriate servers that are on-line, thereby also providing a potential load-balancing function under demanding conditions. Middleware is the primary catalyst for creating a distributed network of servers and clients.

Middleware performs a number of functions in this environment.

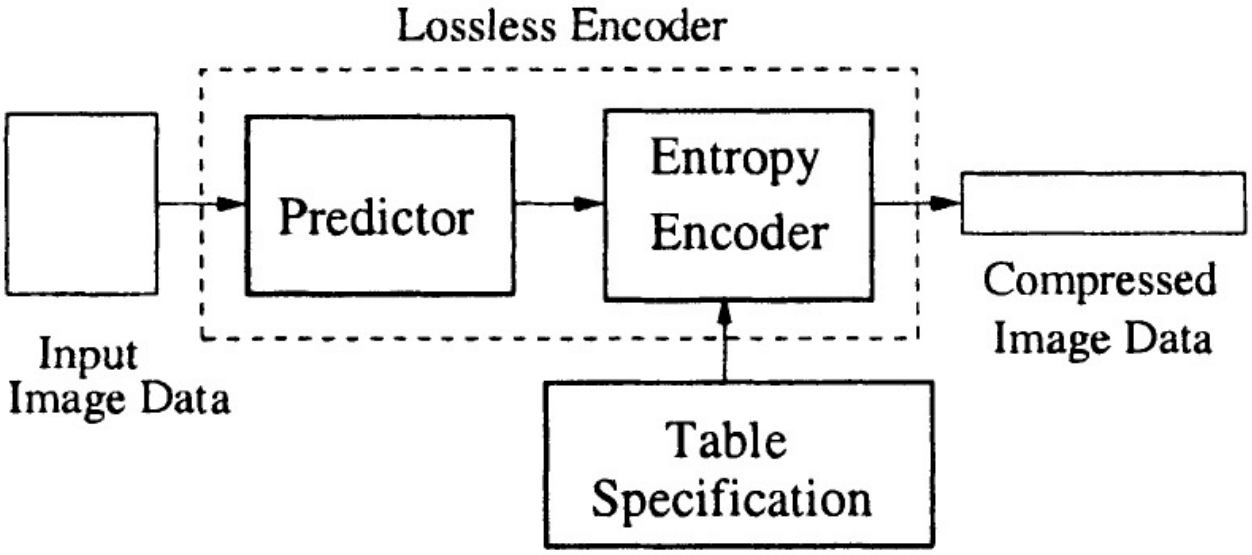
1) Provide the user with a local index, an object directory, for objects with which a client is concerned
2) Provide automatic object directory services for locating available copies of objects
3) Provide protocol and data format conversions between the client requests and the stored formats in the server.

b) Statistical coding: **(Exp. 2Marks, Diag. 2 Marks)**

The output of the zigzag sequence is fed to the statistical encoder, where the statistical encoding is done on data with the help of table specification. Sequential encoding, where each Image component is encoded in the same order that it was scanned;

Predictive coding:-

The different predictor choices specify how many and which adjacent pixels are used to predict the next pixel. The statistical coding in lossless mode can use either of the two methods specified for DCT mode and is similar to what is specified for the DC coefficient of DCT mode. The lossless compression will work with source image having from 2 to 16 bpp and typically deliver around 2:1 compression for photographic color image. The table specification provides different different tables for each component of multi component image for better compression.

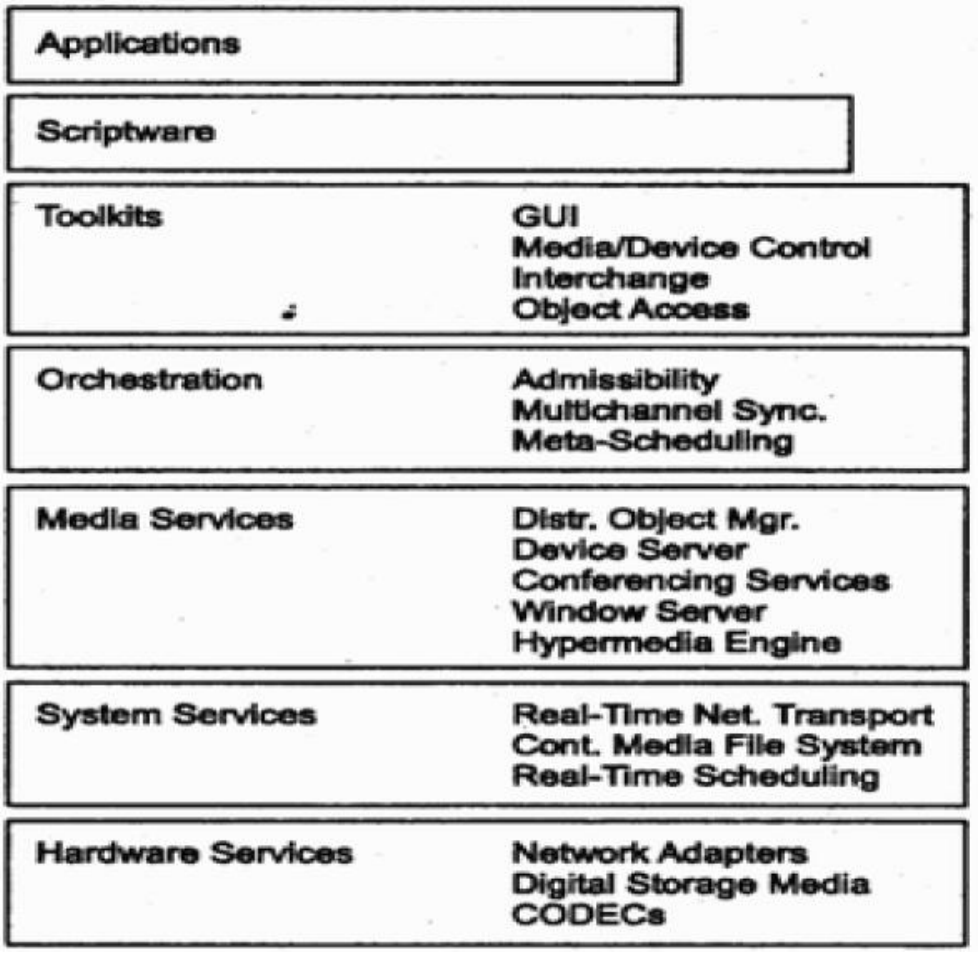


c) Scripting Language and conference services:- **(Exp. 2Marks, Diag. 2 Marks)**

Scripting Language: - Special purpose programming languages for controlling interactive multimedia documents, presentations, and applications.

Conference services: - Facilities for managing multiparty communications using high-level call model abstractions.

Diagram for scripting services are follows



d) Entropy encoding:- **(Exp. 2Marks, Diag. 2 Marks)**

Entropy, as used in data compression, is a measure of the information content of usages in number of bits. It is mathematically represented as follows

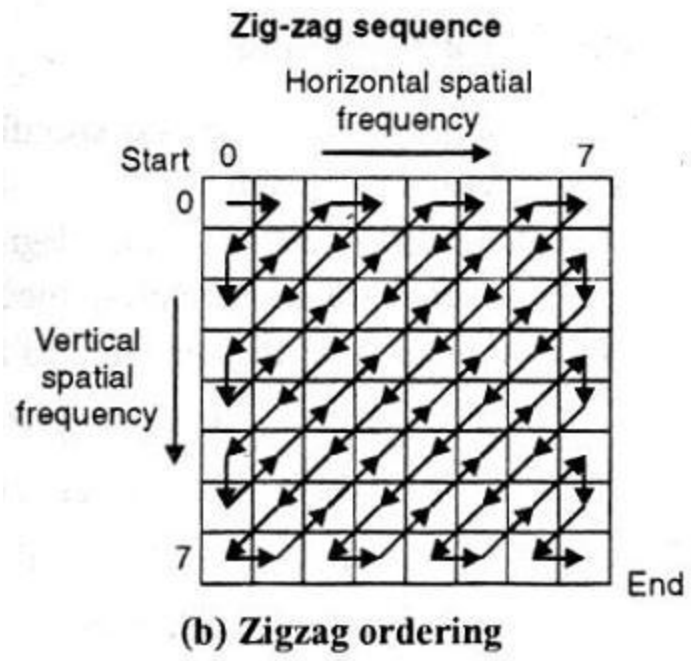
$$\text{Entropy in no of bits} = \log_2 (\text{probability of objects})$$

The JPEG std specifies to entropy encoding schemes; Huffman coding and arithmetic coding. The JPEG baseline sequential codec algorithm specifies Huffman coding.

Zigzag sequencing:-

In order to create a bit stream where coefficients that are more likely to be nonzero (low-frequency ones) are placed before coefficients that are more likely to be zero (high-frequency ones), the zigzag sequence shown by Figure

is used to read the coefficients into the bit stream The result Is that all the zero-value coefficients tend to be together at the end of the block and can be transmitted with very few bits using a simple run-length code.



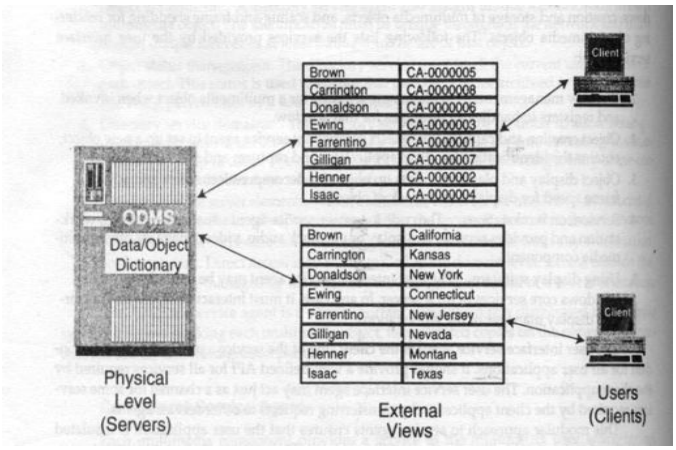
(b) Zigzag ordering

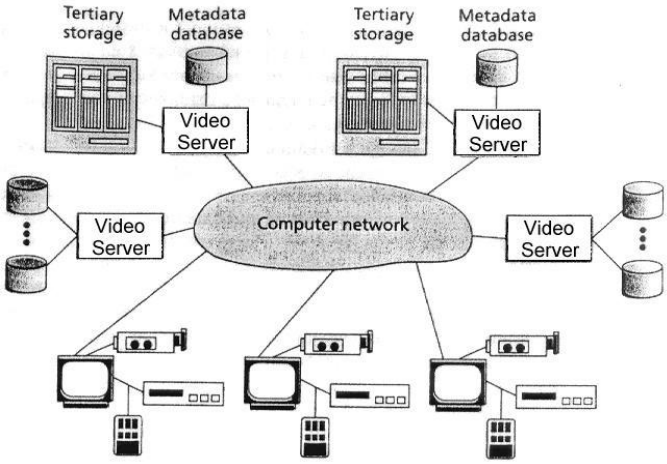
e) Distributed client-server operation:- **(Exp. 2Marks, Diag. 2 Marks)**

Generally client-server architecture are used for some time for relational databases such as Sybase and Oracle, multimedia applications require functionality beyond the traditional client-server architecture.

Most client-server systems were designed to connect a client across a network to a server that provided database functions.

Figure describes the client and server custom views in a large distributed database.





In multimedia databases, we have a combination of real-world data objects as well as projections in images, sound, and video. While raw data such as numbers or text fields are meaningful to the database, multimedia objects are not. The database must assign some form of identification and an understanding of the data. Furthermore, on retrieval these objects may need special processing before being rendered on user screens.

Role & characteristics of clients:-

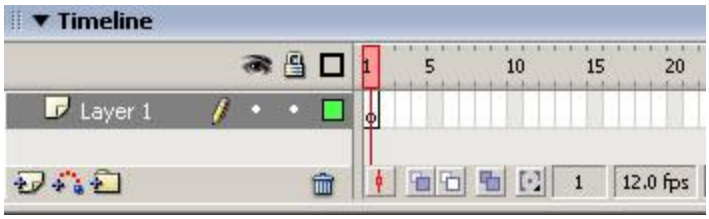
1) Request specific Textual data
2) Request specific Multimedia object
3) Require activation of a rendering server application
4) Create & store multimedia objects on servers
5) Request directory information

Role & characteristics of servers:-

1) Provide storage for a variety of object classes
2) Transfer objects on demand to clients
3) Provide hierarchical storage
4) System administration functions
5) Transport system for high speed LAN & WAN server-server

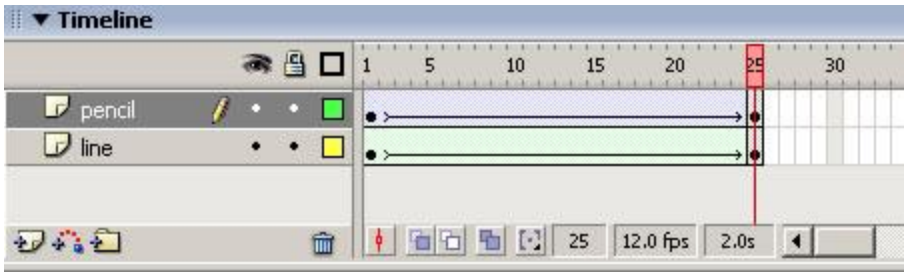
f) Inserting Layer and shape:- **(Layer 2Marks, Shape 2 Marks)**

1) Open a new flash file (Ctrl+N). New Document window will appear Select General panel and choose Type: Flash Document. Press OK.
2) If your timeline window is not open, press (Ctrl+Alt+T).
3) Now you can see a single Layer called "Layer1" in your timeline Window.



4) Create a Shape Tween on Layer1. Similar to the one in Shape Tween Tutorial.
5) Single click on add new layer button.

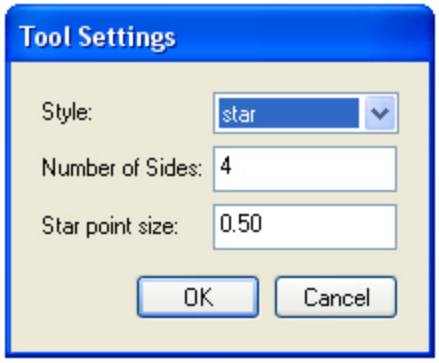
6) A new layer gets added. By default it will be named "Layer 2".
7) Create a Motion Tween on Layer 2. Similar to the one in Motion Tween Tutorial. After creating two layers, your timeline will look something like the one shown below.



8) Now press (Ctrl+Enter) to view your motion tween.

9) **Creating the Star Shape: -** Select the Polystar tool from the tool box (if it is hidden click on the Rectangle Tool and hold down the mouse till the Polystar tool displays). With the Polystar tool selected you can then set the properties of the tool in the Properties Inspector at the bottom of the screen.

10) This is where we will choose the Star shape, 4 points and a point size of 0.50. Then click OK.



11) Now that the tool is set draw out a small star shape.

Q. 6) Attempt any 4 **16 Marks**

a) The Telephone Metaphor:- **(Exp. 1 Mark, Diag. 1 Mark)**

1) The telephone until very recently was considered as an independent office appliance.

2) The advent of voice mail systems was the first step in changing the role of the telephone.

3) With the standards for the voice mail file formats and digital storage of sound for computer systems coming closer together, use of the computer system to manage the phone system was a natural extension of the user's desktop.

4) Most PCs now include speakers and microphones, the two essential components of a phone system.

5) Fig shows how a telephone can be created on a screen to make it a very intuitive user interface.

6) A big advantage of computer system is that is that it already set up to process information and performs database lookups.

7) The telephone metaphor on computer system combines normal windows user interface ideas with the telephone keypad.

The VCR metaphor:- **(Exp. 1 Mark, Diag. 1 Mark)**

1) The easiest user interface for functions such as video capture, channel play, and stored video playback is to emulate the camera, television, and VCR on screen.
2) Fig shows an example of TV/VCR metaphor used in video playback applications.
3) The user interface shows all functions one would find in a typical video camera when it is in a video captured mode.
4) VCR emulation illustrated in fig extends the VCR metaphor to allow editing.

b) Object linking and embedding and difference between them: (Exp. 2 Marks, Diff. 2 Marks)

A linked object contains only the data needed to represent the object (its presentation data) and a pointer to an actual file that contains the original data plus information needed to edit the object. (its native data).

An embedded object, on the other hand, includes both presentation and native data.

i.e. **an embedded object** has the object itself along with the information needed to edit the object. Embedding makes a document large, but it allows the document to be transferred to another workstation (with an embedded copy of the object) and edited. The original copy of the object is not affected when an embedded copy is edited. Embedded video objects cause the database to become very large, slowing data retrieval for all components of the hypermedia document.

Differences are:-

1) In object linking original copy of the object is affected whereas in embedding original copy of the object is not affected when embedded copy is edited.
2) Embedding an object increases the memory space required by the document in which object is embedded whereas in linking a link is included rather than the object.

c) Different color model:-

Cromacity Model:- (1 Mark)

It is a 3D model with 2D x and y, defining the color and third dimension defining the luminescence. It is an additive model since x and y are added to generate different colors.

RGB Model:- (2 Marks)

The television monitor and camera hardware manufacturer developed the RGB model to use in the design of image capture devices, television and color monitors. The model is additive in those different intensities of red, green and blue (RBG) are added to generate various colors.

HSI Model:- (1Mark)

The hue saturation intensity (HSI) model represents an artist's impression of tint, shade and tone. This model is used in image processing.

d) Holographic images and its use. **(Exp. 2 Marks, Uses. 2 Marks)**

Holographic Images Holography is defined as the means of creating a unique photo graphic image without the use of a lens. The photographic recording of the image is called a hologram, which appears to be an unrecognizable pattern of stripes and whorls but which, when illuminated by coherent light as by a laser beam, organizes the light into a three-dimensional representation of the original object.

Holography records not only the intensity of light as it is reflected from an object, but also the phase (that is, the degree to which the reflected waterfronts are in step with each other, or coherent). Note that ordinary light is incoherent.

In continuous-wave laser holography, a beam of coherent laser light is directed on an object in a darkened room. The beam is reflected, scattered, and diffracted by the physical features of the object and arrives on a photographic plate at the same time that a part of the original beam also arrives at the photographic plate.

The two beams cause interference, which results in a complex pattern of stripes and whorls. The developed plate is called a hologram.

When coherent light passes through the hologram, the hologram acts as a diffraction grating, bending or diffracting some of the light beams to exactly reverse the original condition of the light waves that created the object.

In other words, the light beams create a three-dimensional rendition of the object that is visible to the human eye on the light beam side and a similar rendition on the other side which can be photographed. Holography can also be achieved in color.

Using pulse-laser holography, a moving object can be made to appear at rest when a hologram is produced with the extremely rapid and high-intensity flash of a ruby laser. This approach is used for applications such as wind-tunnel experiments for aircraft wing design.

Holograph images can also be recorded on materials other than photographic plates. Holographs on credit cards are used to ensure authenticity. Increasingly, holography is being used in design and manufacturing for tasks that could not be performed easily by other tools, due to either limited access or due to the level of detail required.

Holographic interferometers provide the capability to view minute surface changes, such as cracks in materials. Our intent with this introduction to holography was only to provide sufficient background to understand the link between holography and multimedia systems. Holograms have been used successfully with specialized display terminals to provide a three-dimensional rendition of objects. For example, a three-dimensional hologram projected by a special display monitor would allow the designer to get inside a jet engine and view the engine in motion from the inside. While not quite at that level yet, this technology is making rapid progress and can become an important component of multimedia systems used for managing design documents or for manufacturing tasks.

e) Objectives of JPEG: **(Any 4 obj. , 1 Mark each)**

1) To be at or near the state of the art for degree of compression versus image quality,

2) To be parameterizable so that the user can select the desired compression versus quality tradeoff,

3) To be applicable to practically any kind of source image, without regard to dimensions, image content, aspect ratio, etc.,

4) To have computational requirements that are reasonable for both hardware or software implementations, and

5) To support four different modes of operation:

   a) Sequential encoding, where each Image component is encoded in the same order that it was scanned;

   b) Progressive encoding, where the image is encoded in multiple passes so that a coarse image is presented rapidly, followed by repeated images showing greater and greater detail;

   c) Lossless encoding, where the encoding guarantees exact reproduction of all the data In the source image;

   d) Hierarchical encoding, where the Image is encoded at multiple resolutions.