Question Bank with Chapter Reference

Internal 2015

Long Questions (5X12=60)

1. Define multimedia.(C1) Discuss the main properties of multimedia system and global structure of multimedia system.(C3)

Definition of Multimedia:
Multimedia refers to the integration of multiple media elements such as text, graphics, audio, video, and animation into a single platform for the purpose of communication or entertainment. A multimedia system is an interactive system that allows users to access and manipulate different media elements simultaneously.

Properties of Multimedia Systems:
a) Interactivity: Multimedia systems allow users to interact with the content by providing features like hyperlinks, buttons, and menus.
b) Integration: Different types of media such as text, graphics, audio, and video can be integrated into a single platform.
c) Synchronization: Multimedia systems can synchronize different media elements such as audio and video to provide a seamless experience.
d) Compression: Large multimedia files can be compressed to reduce storage space and improve transmission efficiency.
e) Scalability: Multimedia systems can be designed to handle different screen sizes, resolutions, and processing capabilities.

Global Structure of Multimedia Systems:
The global structure of a multimedia system typically consists of three components:
a) Input devices: These devices are used to input media elements into the system. Examples include microphones, cameras, scanners, and keyboards.
b) Processing devices: These devices are responsible for processing and manipulating the media elements. Examples include CPUs, GPUs, and DSPs.
c) Output devices: These devices are used to display or play back the media elements. Examples include monitors, projectors, speakers, and printers.

The multimedia system also includes software components such as media players, codecs, and authoring tools that facilitate the creation, processing, and playback of multimedia content. Additionally, network components such as servers and routers enable the distribution and sharing of multimedia content over a network.

2. Define multimedia communication.(C2) Explain different components for multimedia communication networks.(C2) List different challenges for multimedia system design. (C3)

Definition of Multimedia Communication:

Multimedia communication refers to the transmission of multimedia data, including text, images, audio, and video, over a communication network. It allows users to interact with each other using various media elements.

Components of Multimedia Communication Networks:

Multimedia communication networks have the following components:

a) Source: The source is the device or application that generates the multimedia data.

b) Transmission Medium: The transmission medium is the physical channel that carries the multimedia data. Examples include cables, wireless networks, and satellite links.

c) Transmission System: The transmission system is the set of hardware and software components that transmit the multimedia data over the transmission medium. It includes modems, routers, switches, and protocols.

d) Receiver: The receiver is the device or application that receives the multimedia data.

Challenges for Multimedia System Design:

Designing a multimedia system presents several challenges, including:

a) Bandwidth: Multimedia files require a large amount of bandwidth, which can be a challenge for network administrators and designers.

b) Compatibility: Multimedia files may not be compatible with all devices and software, requiring the use of different codecs and file formats.

c) Synchronization: Synchronizing different media elements such as audio and video can be challenging and require specialized hardware and software.

d) Quality of Service: Multimedia applications require a high level of quality of service (QoS) to ensure smooth playback and user experience.

e) Security: Multimedia files can be vulnerable to various security threats, including piracy, hacking, and malware. Adequate security measures must be implemented to protect against these threats.

3. What do you mean by computer-based animation?(C1) What are the steps involved in MPEG compression technique. (C5)

Definition of Computer-Based Animation:

Computer-based animation refers to the creation of animated content using digital technologies. It involves using software to generate and manipulate images, graphics, and visual effects to create moving pictures.

Steps Involved in MPEG Compression Technique:

MPEG compression is a widely used technique for compressing digital video files. The following are the steps involved in MPEG compression:

a) Intra-frame Compression: In this step, each frame of the video is compressed independently using a technique called discrete cosine transform (DCT), which reduces the amount of redundant information in each frame.

b) Inter-frame Compression: In this step, the differences between consecutive frames are compressed using motion estimation and compensation techniques. Instead of storing each frame individually, only the differences between frames are stored, resulting in significant compression.
c) Quantization: After compression, the data is quantized to reduce its size further. This involves rounding off values to the nearest integer.
d) Entropy Coding: In this step, the quantized data is encoded using a lossless compression technique such as Huffman coding or arithmetic coding.
e) Bitstream Multiplexing: In this final step, the compressed video, audio, and metadata streams are multiplexed into a single bitstream for transmission or storage.

MPEG compression is used in a variety of applications, including DVD and Blu-ray disc authoring, digital broadcasting, and internet streaming. The technique allows for high-quality video playback with a relatively small file size.

4. Why video compression is required?(C5) Describe the steps involved in MPEG compression technique.(C5)

Video compression is required to reduce the size of video files without compromising on the quality of the video. This is important because video files can be very large and take up a lot of storage space, and also require a lot of bandwidth to transmit over the internet. Compression techniques enable video files to be compressed to a smaller size while maintaining a reasonable level of quality, making it easier to store, transmit and share videos.

The MPEG (Moving Picture Experts Group) compression technique is a popular and widely used video compression method. It involves the following steps:

Spatial Compression: In this step, the video frame is divided into small blocks of pixels, and redundant information is removed from these blocks. The blocks are then grouped together to form macroblocks, which are further compressed using techniques like Discrete Cosine Transform (DCT).

Temporal Compression: This step involves identifying and removing redundant information between video frames. The technique used for this is called motion estimation, which involves analyzing the movement of objects in the video and predicting their location in subsequent frames. The difference between the predicted location and the actual location is compressed and stored.

Quantization: This step involves reducing the precision of the data to be stored. This is done by dividing the data into small intervals and rounding off the values to the nearest interval. This helps in further reducing the size of the video file.

Encoding: In this step, the compressed data is encoded into a format that can be easily transmitted over the internet or stored on a device. The most commonly used format is the MPEG-4 format, which uses a combination of spatial and temporal compression techniques to achieve high-quality video compression.

Overall, the MPEG compression technique involves a combination of spatial and temporal compression techniques, along with quantization and encoding, to achieve efficient and effective video compression.

5. Why Huffman encoding technique is essential in multimedia?(C5) A source generate the symbols S1, S2, S3, S4, and S5 randomly with probability of P1=0.16, P2=0.51, P3=0.09, P4=0.13 and P5=0.11 respectively. Generate the code word for each symbol using Huffman's coding and also calculate the compression ratio and relative redundancy of the system.(C5)

Huffman encoding technique is essential in multimedia because it is a lossless data compression technique that can be used to compress digital data without losing any information. It works by assigning variable-length codes to each symbol based on their probability of occurrence in the data. This means that symbols that occur more frequently are assigned shorter codes, while symbols that occur less frequently are assigned longer codes.

The compression ratio of a Huffman-encoded data can be calculated by dividing the size of the original data by the size of the compressed data. The relative redundancy can be calculated by subtracting the compression ratio from 1 and multiplying the result by 100.

To generate the Huffman codes for the given symbols and probabilities, we follow these steps:

Arrange the symbols in decreasing order of their probabilities: S2, S4, S1, S5, S3.
Group the two least probable symbols and assign them a common code bit of 0 and 1, respectively.
Calculate the new probabilities for the grouped symbols by adding their individual probabilities.
Grouping S3 and the symbol with the next smallest probability of P4: P3+P4 = 0.22
Grouping S5 and the symbol with the next smallest probability of P3+P4: P5+(P3+P4) = 0.33
Grouping S1 and the symbol with the next smallest probability of P2: P1+P2 = 0.67
Repeat step 2 and 3 until all symbols are grouped into a single code.
The resulting Huffman code words for each symbol are:

S2: 0
S4: 10
S3: 110
S5: 111
S1: 1
The size of the original data can be calculated as follows:
Size = (P1 + P2 + P3 + P4 + P5) * log2(5) = 2.1738 bits/symbol * 1000 symbols = 2173.8 bits

The size of the Huffman-encoded data can be calculated as follows:
Size = (P1 * 1 + P2 * 1 + P3 * 3 + P4 * 2 + P5 * 3) * 1000 = 2080 bits

Therefore, the compression ratio is:
Compression Ratio = Size of Original Data / Size of Compressed Data = 2173.8 / 2080 = 1.045

The relative redundancy is:
Relative Redundancy = (1 - Compression Ratio) * 100 = (1 - 1.045) * 100 = -4.5%

This negative value indicates that the Huffman-encoded data is smaller than the original data, indicating a compression gain.

6. Why quality of service (QOS) is measured in multimedia?(C7) Why it is so important?(C7) Describe the importance of RTP and RSVP in multimedia.(C6)

Quality of Service (QoS) is a critical parameter for multimedia applications as it determines the level of user satisfaction. In multimedia, QoS measures various parameters, such as delay, jitter, packet loss, and throughput, to ensure that the user receives a high-quality multimedia experience. QoS is essential in multimedia applications because multimedia traffic is delay-sensitive and requires real-time delivery with a guaranteed quality of service.

Real-time Transport Protocol (RTP) and Resource Reservation Protocol (RSVP) are two important protocols used in multimedia applications to ensure QoS. RTP is used to deliver real-time multimedia content, such as audio and video, over the internet. RTP provides mechanisms for packetization, sequencing, timestamping, and delivery monitoring. It also allows the receiver to detect lost packets and request their retransmission. RTP is essential in multimedia because it provides reliable and efficient delivery of real-time multimedia content.

RSVP is used to reserve network resources for real-time multimedia applications. RSVP allows applications to request a specific QoS from the network, and the network reserves the resources required to meet the requested QoS. RSVP also provides mechanisms for admission control, policy control, and traffic policing. RSVP is critical in multimedia because it ensures that the network has sufficient resources to deliver the required QoS for real-time multimedia applications.

In summary, QoS is essential in multimedia because it determines the level of user satisfaction, and RTP and RSVP are critical protocols in multimedia because they ensure reliable and efficient delivery of real-time multimedia content and reserve network resources to meet the required QoS.

7. What do you mean by multimedia retrieval?(C8) Describe about RAID level 0, RAID level 1, and RAID level 2 in detail.(C8)

Multimedia retrieval refers to the process of searching and retrieving multimedia data, such as images, audio, and video, from a collection of multimedia content. The goal of multimedia retrieval is to allow users to find the specific multimedia content they are looking for, based on various search criteria, such as text-based queries, visual features, or semantic concepts.

RAID (Redundant Array of Inexpensive Disks) is a technology used to improve the reliability and performance of storage systems by combining multiple hard drives into a single logical unit. There are different levels of RAID, each with its own characteristics and advantages. Here's a brief overview of RAID levels 0, 1, and 2:

RAID level 0: Also known as striping, RAID 0 is the simplest and fastest level of RAID. It requires at least two hard drives and distributes data across them in equal-sized blocks. This allows for high read and write speeds, but it provides no redundancy or fault tolerance. If one drive fails, all data is lost.

RAID level 1: Also known as mirroring, RAID 1 provides redundancy by creating an exact copy of data on two or more hard drives. It requires at least two hard drives and provides fault tolerance in case of a drive failure. However, it requires more storage space and has lower write speeds than RAID 0.

RAID level 2: RAID 2 is rarely used today, as it was designed for systems that required very high data transfer rates and low error rates, such as mainframe computers. It uses a technique called bit-level striping, which distributes data at the bit level across multiple drives and uses a dedicated error correction code (ECC) drive to detect and correct errors. It requires at least three drives and is not very cost-effective compared to other RAID levels.

Short Questions (4X5=20)

8. Describe the traditional data stream characteristics of multimedia. (C1)

Multimedia data streams typically have the following traditional characteristics:

Time-sensitive: Multimedia data, such as audio and video, are time-sensitive and must be delivered within specific time intervals to ensure proper synchronization and playback.

High Bandwidth Requirements: Multimedia data streams can be quite large, requiring significant bandwidth to transmit them effectively. This can be particularly challenging in networks with limited bandwidth.

Variable Bit Rate: Multimedia data streams often have variable bit rates, meaning that the amount of data being transmitted can vary depending on the content being delivered. For example, a video stream may require more bandwidth when displaying a fast-moving scene than when showing a static image.

Real-time Processing: Multimedia data streams require real-time processing to ensure smooth playback. This means that data must be processed and delivered quickly enough to avoid delays or interruptions in playback.

Error Sensitivity: Multimedia data streams are sensitive to errors, and even small errors in the transmission or processing of data can result in significant degradation in quality. Therefore, multimedia applications typically employ error correction techniques to ensure reliable transmission and playback.

Quality of Service Requirements: Multimedia data streams have strict Quality of Service (QoS) requirements, including low latency, high reliability, and high throughput. Meeting these requirements can be challenging, particularly in networks with high traffic or limited resources.

Overall, these characteristics make multimedia data streams challenging to handle and require specialized techniques and protocols to ensure efficient and reliable delivery.

9. What is sound?(C3) Explain how sound is represented digitally by computer.(C3)

Sound is a form of energy that travels through the air as vibrations or waves that can be detected by our ears. These vibrations are created by a source, such as a musical instrument or a person's voice, and they travel through the air as a series of compressions and rarefactions of the air molecules.

When it comes to digital representation of sound, computers use a process called analog-to-digital conversion (ADC) to convert the continuous waveforms of sound into digital signals that can be processed and stored. This process involves measuring the amplitude of the sound wave at regular intervals and assigning a numerical value to each measurement.

The numerical values obtained through ADC are then used to create a digital representation of the sound waveform, which can be stored as a digital audio file in a variety of formats, such as WAV or MP3. This digital representation can be processed and manipulated by computer software to perform tasks such as editing and mixing.

When it comes to playback, computers use digital-to-analog conversion (DAC) to convert the digital signals back into analog sound waves that can be played through speakers or headphones. The process involves using the numerical values stored in the digital audio file to reconstruct the original waveform and output it as sound.

10. Define medium.(C2) Explain how media is classified?(C2)

In general, a medium refers to a means of communication or expression that is used to convey information, messages, or ideas from one person or group to another. Examples of media include newspapers, magazines, television, radio, books, social media, and the internet.

Media can be classified into different categories based on various factors, such as the format or mode of delivery, the intended audience, and the type of content. Here are some common ways media is classified:

Print media: This category includes publications such as newspapers, magazines, books, and brochures that are printed on paper or other materials.

Broadcast media: This category includes media that is transmitted over the airwaves or through cables, such as television and radio programs.

Digital media: This category includes media that is delivered through electronic devices and the internet, such as websites, blogs, social media platforms, podcasts, and online video content.

Mass media: This refers to media that is designed to reach a large audience, such as newspapers, television, and radio.

Niche media: This refers to media that is targeted to a specific group or audience, such as trade publications, specialty magazines, and social media groups.

News media: This refers to media that focuses primarily on reporting current events and news stories.

Entertainment media: This refers to media that is designed to entertain and engage audiences, such as movies, television shows, and video games.

Educational media: This refers to media that is designed to educate and inform audiences, such as documentaries, instructional videos, and online courses.

Overall, the classification of media is constantly evolving as new technologies and forms of communication emerge.

11. Define resolution.(C3) How an image is represented in computer.(C3) 12. Discuss about hypertext, hypermedia and multimedia.(C9) 13. Write short notes on:
    a. HDTV(C11)
    b. Luminance and Chrominance components(C3)
    c. Hybrid Encoding (C5)

Resolution refers to the number of pixels in an image. It is the level of detail that an image has, and is measured in pixels per inch (PPI) or dots per inch (DPI). In computer graphics, an image is represented using pixels, which are small colored squares arranged in a grid. The more pixels an image has, the higher its resolution and the more detail it can display. The resolution of an image also affects its file size and the quality of its output.

Hypertext is a way of presenting information on a computer screen that allows users to navigate through different pieces of information by clicking on links. It enables non-linear reading of text, where a reader can jump to any section of the document instead of reading it in a sequential manner.

Hypermedia is an extension of hypertext that includes other types of media, such as images, audio, and video. It allows users to navigate through various media elements using links.

Multimedia refers to the integration of different types of media, such as text, images, audio, and video, in a single digital document. It enables a more engaging and interactive user experience and is commonly used in various fields such as education, entertainment, and marketing.

a. HDTV (High Definition Television) is a digital television broadcasting system with higher resolution than traditional analog television. It offers a more detailed and sharper image with a widescreen aspect ratio of 16:9. HDTV broadcasts are available in various resolutions, including 720p, 1080i, and 1080p.

b. Luminance and chrominance components are used in color television to represent the brightness and color information of an image, respectively. Luminance refers to the black-and-white part of an image and is represented by the Y component. Chrominance represents the color information and is divided into two components: U and V. The YUV color model is commonly used in digital video and is converted to RGB format for display on a computer screen.

c. Hybrid encoding is a technique used in video compression that combines both inter-frame and intra-frame coding methods. In inter-frame coding, only the differences between adjacent frames are encoded, while in intra-frame coding, each frame is encoded independently. Hybrid encoding combines these two methods to achieve better compression and video quality. It is used in various video compression standards, including H.264 and MPEG-4.
External 2013

Long Questions (5X12=60)

1. What is multimedia?(C1) Discuss the properties, issues and the challenges for multimedia systems.(C3) Explain the mode of media transmission.(C2) Brief about the classification of medium.(C2)

Multimedia refers to the integration of different types of media such as text, audio, images, video, and animations into a single digital file or presentation. Multimedia systems are used in a variety of applications such as education, entertainment, advertising, and communication.
Properties of multimedia systems:

Interactivity: users can interact with the multimedia content.
Integration: multiple types of media can be combined into a single presentation.
High-quality audio and video: multimedia systems provide high-quality audio and video content.
Scalability: multimedia systems can be designed to accommodate a large number of users simultaneously.
Issues and challenges for multimedia systems:

Large file sizes: multimedia content can be very large and require significant storage and bandwidth.
Compatibility: multimedia systems must be compatible with a variety of different devices and platforms.
Security: multimedia content can be vulnerable to unauthorized access and piracy.
Copyright infringement: multimedia systems must respect the intellectual property rights of content creators.
Mode of media transmission:
The mode of media transmission refers to the method used to transmit multimedia content from one device to another. There are three main modes of media transmission:

Unicast: multimedia content is sent from one device to one other device.
Multicast: multimedia content is sent from one device to multiple devices simultaneously.

Broadcast: multimedia content is sent from one device to all devices within a particular range or area.
Classification of medium:
Media can be classified into two main categories:

Analog media: media that is represented by continuous signals, such as sound waves or photographs.
Digital media: media that is represented by discrete signals, such as binary code or pixels. Digital media is used in most modern multimedia systems.
Media can also be further classified based on the type of content it represents, such as text, audio, video, or images.

2. What do you mean by data compression?(C5) Describe in details about the fundamentals of multimedia data compression coding technique.(C5)

Data compression refers to the process of reducing the size of a file or data stream without losing any significant information. The goal of data compression is to minimize storage requirements and transmission bandwidth while maintaining a high level of fidelity and usability of the data.
Fundamentals of multimedia data compression coding technique:

Lossless compression:
Lossless compression algorithms reduce the size of a file without losing any information. These algorithms use techniques such as run-length encoding, Huffman coding, and arithmetic coding to compress the data. Lossless compression is typically used for data that cannot be modified or altered, such as text or program files.

Lossy compression:
Lossy compression algorithms reduce the size of a file by selectively discarding information that is considered less important. These algorithms use techniques such as transform coding, quantization, and entropy coding to compress the data. Lossy compression is typically used for data that can be modified or altered, such as audio, images, and video.

Transform coding:
Transform coding is a technique used in lossy compression that converts the data from its original domain into a different domain, where the data can be compressed more efficiently. For example, audio data can be transformed from the time domain to the frequency domain using a Fourier transform, and then compressed using techniques such as quantization and entropy coding.

Quantization:
Quantization is a process that reduces the precision of the data by mapping a range of input values to a smaller set of output values. This reduces the amount of data that needs to be transmitted or stored. In lossy compression, the degree of quantization can be adjusted to control the amount of compression and the level of fidelity of the compressed data.

Entropy coding:
Entropy coding is a technique used in both lossless and lossy compression to encode data using variable-length codes that assign shorter codes to more frequently occurring data and longer codes to less

frequently occurring data. The most common entropy coding techniques are Huffman coding and arithmetic coding.

In summary, multimedia data compression coding techniques involve the use of lossless and lossy compression algorithms, transform coding, quantization, and entropy coding to reduce the size of multimedia data while maintaining a high level of fidelity and usability.

3. Why is Huffman coding technique essential in multimedia?(C5) Explain with some suitable example.(C5)

Huffman coding is a technique used for data compression that assigns shorter codes to frequently occurring characters or symbols in a given data set. This reduces the overall size of the data, making it easier to store and transmit. In multimedia applications, where large amounts of data such as images, videos, and audio are involved, Huffman coding is an essential technique for achieving efficient data compression.

For example, consider a grayscale image with 256 shades of gray, each represented by an 8-bit pixel value. If we want to store this image without any compression, it would require 256 x 8 = 2048 bits per pixel. However, by using Huffman coding, we can assign shorter codes to the most frequently occurring shades of gray, and longer codes to the less frequent ones. This can significantly reduce the number of bits required to represent the image.

Another example is in video compression, where each frame of a video can be compressed using Huffman coding to reduce the amount of data required to store it. The compression can be further enhanced by using other techniques such as motion compensation, where only the changes between consecutive frames are stored, rather than the entire frame.

In summary, Huffman coding is essential in multimedia applications as it helps to achieve efficient data compression, which in turn reduces storage and transmission costs.

4. Describe optical media storage?(C8) Explain the level of RAID technology.(C8)

Optical Media Storage:

Optical media storage refers to the use of laser technology to store and retrieve data on media such as CDs, DVDs, and Blu-ray discs. The media consists of a reflective layer that reflects laser light, and a non-reflective layer that absorbs it. The data is stored on the non-reflective layer as a series of pits and lands, which correspond to 1s and 0s in binary code. When the laser reads the data, it detects the changes in reflectivity caused by the pits and lands.

Optical media has the advantage of being relatively inexpensive, portable, and durable. However, it has limited capacity compared to other storage media such as hard disk drives and solid-state drives. Also, it is vulnerable to scratches, dust, and other forms of damage that can cause read errors.

Level of RAID Technology:

RAID (Redundant Array of Independent Disks) is a technology that combines multiple hard drives into a single logical unit for improved performance, data redundancy, or both. RAID is categorized into several levels, each offering different benefits and drawbacks.

RAID 0: Also known as striping, RAID 0 divides data across multiple drives for improved performance. However, there is no redundancy, so if one drive fails, all data is lost.

RAID 1: Also known as mirroring, RAID 1 creates an exact copy of data on a second drive for redundancy. However, it offers no performance benefits.

RAID 5: RAID 5 distributes data and parity information across multiple drives for both performance and redundancy. It requires a minimum of three drives and can tolerate one drive failure without data loss.

RAID 6: Similar to RAID 5, RAID 6 uses two sets of parity information to provide increased redundancy. It requires a minimum of four drives and can tolerate up to two drive failures without data loss.

RAID 10: Also known as RAID 1+0, RAID 10 combines mirroring and striping for both performance and redundancy. It requires a minimum of four drives and can tolerate up to one drive failure per mirrored set without data loss.

Overall, the choice of RAID level depends on the desired balance of performance, redundancy, and cost.

5. How is Quality of Service (QoS) measured in multimedia?(C7) Why is it so important?(C7)

Quality of Service (QoS) in multimedia refers to the level of service that is provided to ensure that multimedia data such as video and audio is transmitted over a network with minimal delay, loss, and jitter, and with high levels of reliability and availability. QoS is measured using various parameters such as bandwidth, latency, packet loss, and jitter.

Bandwidth is the amount of data that can be transmitted over a network in a given period, and it determines the maximum amount of multimedia data that can be transmitted at any given time. Latency refers to the time taken for data to travel from the source to the destination, and it determines how quickly multimedia data can be transmitted. Packet loss refers to the number of packets that are lost during transmission, and it can lead to degraded audio and video quality. Jitter refers to the variation in packet delay, which can result in inconsistent audio and video playback.

QoS is important in multimedia applications because it ensures that the quality of the multimedia data is maintained during transmission, which is essential for providing a good user experience. Without QoS, multimedia data may experience delays, interruptions, or degradation in quality, leading to a poor user experience. For example, in video conferencing applications, QoS is crucial to ensure that the video and audio streams are delivered in real-time and with high quality, which is essential for effective communication.

In summary, QoS is measured in multimedia using various parameters such as bandwidth, latency, packet loss, and jitter, and it is important because it ensures that multimedia data is transmitted with

minimal delay, loss, and jitter, and with high levels of reliability and availability, which is essential for providing a good user experience.

6. Describe the importance of RTP/RCTP over multimedia.(C6)

Real-time Transport Protocol (RTP) and Real-time Control Protocol (RTCP) are used in multimedia applications to ensure that audio and video data is transmitted in real-time with high quality and minimal delay. RTP is responsible for transporting the actual media data, while RTCP is used to provide feedback about the quality of the transmission and to manage the control mechanisms of the multimedia session. Together, they form a reliable transport protocol for multimedia data.

The importance of RTP/RTCP in multimedia can be summarized as follows:

Real-time transmission: RTP is designed to transport real-time data, such as audio and video, with minimal delay. This is essential for applications such as video conferencing, live streaming, and online gaming, where even a slight delay can have a significant impact on the user experience.

Quality of Service (QoS): RTP/RTCP provide mechanisms for monitoring and controlling the quality of the transmission, such as packet loss, latency, and jitter. This allows for the implementation of QoS mechanisms to ensure that the multimedia data is transmitted with high quality and reliability.

Interoperability: RTP/RTCP are open standards that are widely supported by different multimedia applications and devices. This ensures interoperability between different systems and platforms, allowing for seamless communication and exchange of multimedia data.

Scalability: RTP/RTCP can be used in both unicast and multicast environments, allowing for scalable transmission of multimedia data to multiple recipients.

Security: RTP/RTCP support various security mechanisms, such as encryption and authentication, to ensure the confidentiality and integrity of the multimedia data during transmission.

Overall, the importance of RTP/RTCP in multimedia lies in their ability to provide a reliable, real-time transport protocol for audio and video data, with mechanisms for monitoring and controlling the quality of the transmission, ensuring interoperability, scalability, and security.

7. Explain the process of wireless and mobile network technology.(C10)

Wireless and mobile network technologies refer to the communication systems that enable wireless communication and allow devices to connect to the internet without the use of physical cables. These technologies are crucial in today's world where people rely heavily on mobile devices to stay connected to the internet.

The process of wireless and mobile network technology involves the following steps:

Wireless transmission: Wireless communication involves the transmission of data using radio waves or infrared signals. In wireless networks, data is transmitted through the air, which eliminates the need for physical cables.

Mobile device connection: Mobile devices such as smartphones, tablets, and laptops use wireless networks to connect to the internet. These devices use wireless signals to connect to the closest network tower, which in turn connects them to the internet.

Network architecture: The network architecture of a wireless network includes a series of interconnected devices such as routers, switches, and access points. These devices are responsible for transmitting and receiving data between devices on the network.

Wireless protocols: Wireless networks use a set of protocols to govern the transmission and reception of data. These protocols include Wi-Fi, Bluetooth, and cellular network protocols such as 4G and 5G.

Security measures: Wireless networks are susceptible to security breaches, and as such, they require robust security measures. These measures include encryption, authentication, and access control.

Mobility management: Mobile devices can move from one location to another, and as such, they require mobility management. This involves the ability of the network to track the location of the device and seamlessly transfer the connection to a new network tower.

Overall, wireless and mobile network technology has revolutionized the way we communicate and access the internet. The process involves the use of wireless transmission, mobile device connection, network architecture, wireless protocols, security measures, and mobility management.

8. Define Hypertext and Hypermedia.(C9) Describe the classification of hypertext and hypermedia with suitable examples.(C9)

Hypertext refers to a type of computer-based text that contains links to other texts or media, allowing the reader to navigate non-linearly through a document. It is a form of interactive text where the reader can choose what information they want to read next.

Hypermedia, on the other hand, is an extension of hypertext that includes multimedia elements such as images, videos, and audio. It provides the reader with a more immersive experience and allows for a greater variety of information to be presented.

Classification of Hypertext:

Linear Hypertext - In this type of hypertext, the reader follows a predetermined path through the document, and the links are used to access additional information related to the current topic. An example of linear hypertext is a book or a magazine article that contains footnotes or endnotes.

Non-linear Hypertext - In this type of hypertext, the reader has more control over the order in which they read the document. The links can be used to jump between different sections of the document, and

the reader can choose the order in which they read the information. A website or an e-book that contains a table of contents and an index is an example of non-linear hypertext.

Classification of Hypermedia:

Text and Image-Based Hypermedia - This type of hypermedia includes text and images, and the links can be used to access additional information related to the current topic. An example of text and image-based hypermedia is a web page that contains links to other pages or to images.

Video and Audio-Based Hypermedia - This type of hypermedia includes video and audio elements, and the links can be used to access additional information related to the current topic. An example of video and audio-based hypermedia is a documentary that includes links to additional information or interviews with experts.

Mixed Media Hypermedia - This type of hypermedia includes a combination of text, images, audio, and video elements, and the links can be used to access additional information related to the current topic. An example of mixed media hypermedia is an interactive educational program that includes text, images, audio, and video elements, with links to additional information or quizzes.

Short Questions (4X5=20)

9. Define Pulse Amplitude Modulation using sampling process.(C3)

Pulse Amplitude Modulation (PAM) is a technique used in communication systems to transmit analog signals over a digital communication channel. It involves the process of sampling an analog signal and converting each sample into a corresponding pulse amplitude value.

The process of Pulse Amplitude Modulation using sampling can be explained as follows:

Sampling: The analog signal is sampled at a regular interval, known as the sampling interval, and each sample is quantized to a specific amplitude value.

Quantization: The quantization process involves converting the continuous analog signal into a discrete signal by selecting the closest digital value to the sampled amplitude value. The number of bits used for quantization determines the number of discrete levels that can be represented by the digital signal.

Pulse Amplitude Modulation: The quantized amplitude values are then used to modulate the amplitude of a series of pulses that represent the digital signal. The amplitude of each pulse corresponds to the quantized amplitude value of the analog signal at that sampling instant.

The resulting PAM signal is a sequence of pulses, where each pulse represents a specific amplitude value of the original analog signal. The PAM signal can be transmitted over a digital communication channel, and the original analog signal can be reconstructed at the receiver end by demodulating the PAM signal.

10. Differentiate between Lossless Mode and Lossy DCT-based mode.(C5)

Lossless and Lossy are two modes of image compression techniques, and DCT (Discrete Cosine Transform) is a widely used method in image compression.

Lossless Mode: Lossless compression is a type of compression where no information is lost during the compression process. In other words, the original image can be completely reconstructed from the compressed image. Lossless compression techniques are used when the highest possible quality is required, but the compression ratio is limited. In Lossless mode, the DCT is not used, and the image is compressed using techniques such as Run-Length Encoding (RLE), Huffman Coding, and Arithmetic Coding.

Lossy DCT-based Mode: Lossy compression is a type of compression where some information is lost during the compression process, which cannot be recovered during decompression. The image is compressed by discarding some of the image data, which is considered less important or redundant. In Lossy DCT-based mode, the DCT is applied to the image to transform it from the spatial domain to the frequency domain. The DCT coefficients are then quantized, and the quantized coefficients are further compressed using techniques such as Huffman Coding, Arithmetic Coding, or Variable Length Coding. During decompression, the quantized coefficients are dequantized and inverse DCT is applied to recover the original image. Lossy compression techniques are used when a higher compression ratio is required, and a slight degradation in quality is acceptable.

In summary, Lossless mode does not use DCT, and the image is compressed without any loss of information, while Lossy DCT-based mode uses DCT to transform the image into the frequency domain, and some information is lost during compression.

11. What in Multicasting in multimedia system?(C6)

Multicasting is a communication technique used in multimedia systems to efficiently deliver the same multimedia content, such as video or audio, to multiple recipients at the same time. In multicasting, a single stream of multimedia data is transmitted over the network, and it is replicated and delivered to multiple recipients who have expressed their interest in receiving the data.

Multicasting is a more efficient technique than unicast, where a separate stream of data is transmitted to each individual recipient, and broadcast, where a single stream of data is transmitted to all the recipients in the network, including those who may not be interested in receiving the data. In a multimedia system, where the same content is required to be delivered to a large number of recipients simultaneously, multicasting can significantly reduce the network traffic and improve the scalability of the system.

Multicast protocols such as Internet Group Management Protocol (IGMP) and Protocol Independent Multicast (PIM) are used to manage and deliver multicast traffic in the network. In a multimedia system, a server can use multicasting to deliver the content to multiple clients who have subscribed to the service, such as video-on-demand or live streaming. The clients can join or leave the multicast group

dynamically, and the content is delivered only to those clients who are interested in receiving it, thus saving bandwidth and reducing network congestion.

12. Discuss different methods used for controlling animation. (C1)

There are several methods used for controlling animation, including:

Keyframe animation: Keyframe animation is a widely used method for controlling animation. In this method, the animator defines specific points in time, known as keyframes, at which the properties of an object change. The computer then interpolates between these keyframes to create smooth motion.

Motion paths: Motion paths are a type of animation control that allow an object to move along a predefined path. The animator specifies the path and the computer handles the motion.

Physics simulation: Physics simulation is a method used for creating realistic animations of physical phenomena, such as gravity, collision detection, and fluid dynamics. This method involves modeling the physical properties of objects and allowing the computer to simulate their behavior.

Constraints: Constraints are used to restrict the movement of an object in specific ways. For example, a constraint could be used to ensure that an object only moves along a certain axis or that it maintains a certain distance from another object.

Scripting: Scripting is a more advanced method used for controlling animation. Animators can write custom scripts that control the behavior of objects in the scene, allowing for more precise control over the animation.

Blendshapes: Blendshapes are a method used for controlling facial animation in 3D models. This method involves creating a set of predefined facial expressions and then blending them together to create a wide range of expressions.

Overall, the choice of animation control method depends on the specific requirements of the project and the skills of the animator. Each method has its own advantages and disadvantages and can be combined in various ways to create complex animations.

13. Describe the application of multimedia in documentation imaging. (C3)

Multimedia can be a valuable tool for documenting imaging by incorporating various types of media such as text, images, videos, and audio to create an interactive and engaging experience for the audience. Here are some examples of how multimedia can be used in documentation imaging:

Illustrating complex concepts: Sometimes, it can be difficult to explain complex medical procedures or technical processes using just text or static images. Multimedia can be used to create interactive diagrams or animations that can help to illustrate these concepts in a more accessible and engaging way.

Enhancing training materials: Multimedia can be used to create training materials that are more engaging and effective. For example, videos can be used to demonstrate proper techniques for using medical equipment, while interactive quizzes can be used to test trainees' knowledge.

Facilitating remote learning: In situations where learners cannot be physically present, multimedia can be used to create online courses that incorporate a variety of media, such as text, images, videos, and quizzes.

Creating patient education materials: Multimedia can be used to create patient education materials that are more engaging and easier to understand than traditional written materials. For example, videos can be used to explain medical conditions or procedures, while interactive diagrams can help patients understand the anatomy of their bodies.

Overall, multimedia can be a powerful tool for documenting imaging, as it allows for the creation of engaging and interactive materials that can be used for training, education, and patient care.

14. How visual effects of motion is possible?(C1) Explain different types of communication channel based on the direction in which they can carry the information. (C3)

Visual effects of motion can be achieved through a variety of techniques and technologies, such as animation, computer-generated imagery (CGI), and practical effects. These techniques involve creating the illusion of motion through a series of still images or frames that are displayed in quick succession, usually at a rate of 24 frames per second or higher.

Animation is a traditional technique that involves creating a series of drawings or models that are photographed or scanned and then played back in sequence to create the illusion of motion. This technique has been used for decades in the creation of cartoons, animated films, and video games.

CGI is a newer technique that involves using computer software to create and manipulate 3D objects and environments. This technique is commonly used in the creation of visual effects for movies and television shows, as well as in video games and other interactive media.

Practical effects involve creating physical objects or special effects on set, such as explosions or pyrotechnics, to create the illusion of motion. These effects are often combined with CGI and other techniques to create a seamless and realistic visual experience.

Regarding the different types of communication channels based on the direction in which they can carry information, there are three main types: one-way communication, two-way communication, and multi-way communication.

One-way communication channels allow information to flow in only one direction, from the sender to the receiver. Examples of one-way communication channels include television broadcasts, radio broadcasts, and advertising.

Two-way communication channels allow information to flow in two directions, between the sender and the receiver. Examples of two-way communication channels include phone calls, video calls, and instant messaging.

Multi-way communication channels allow information to flow in multiple directions, between multiple senders and receivers. Examples of multi-way communication channels include group chats, online forums, and social media platforms.

15. Explain the following terms:
    a. Sampling rate (C3)
    b. Quantization (C3)
    c. Seek latency (C3)

a. Sampling rate is a term used in digital signal processing and refers to the number of samples per second that are taken from an analog signal to convert it into a digital signal. It is typically measured in hertz (Hz) or kilohertz (kHz) and determines the level of detail that can be captured in the digital signal. A higher sampling rate results in a more accurate representation of the original analog signal, but also requires more storage space and processing power.

b. Quantization is the process of converting an analog signal into a digital signal by assigning a numerical value to each sample based on a set of discrete levels or steps. This process involves rounding the sampled analog signal to the nearest value in the quantization scale, which can result in a loss of accuracy and detail. The level of quantization is determined by the number of bits used to represent each sample, with higher bit depth resulting in a more accurate representation of the original analog signal.

c. Seek latency is a term used in computer storage devices, such as hard drives, and refers to the time it takes for the device to locate and access a specific piece of data. This latency is caused by the physical movement of the read/write head, which must first be positioned over the correct track and sector before the data can be read or written. Seek latency can have a significant impact on the overall performance of a storage device, and is often measured in milliseconds (ms).

External 2011

Long Questions (5X12=20) = 60

1. What is Multimedia?(C1) Explain the role of media transmission.(C2) Also brief about the classification of medium.(C2)

Multimedia refers to the combination of different types of media such as text, audio, video, graphics, and animation in a digital format. It is a form of communication that uses different forms of media to convey information to a large audience.

Media transmission refers to the process of delivering multimedia content from one location to another. This process is essential for the dissemination of information to a wide audience. It involves the use of different types of media such as cables, wireless networks, satellite systems, and the internet.

Media can be classified into different categories based on their properties and characteristics. Here are some common classifications of media:

Textual media: This includes written content such as books, newspapers, and magazines.
Audio media: This includes music, podcasts, radio broadcasts, and sound recordings.
Video media: This includes movies, TV shows, and other visual content.
Graphic media: This includes images, illustrations, and other visual representations.
Animation media: This includes animated content such as cartoons, simulations, and special effects.
These classifications can be further divided into analog and digital media. Analog media includes traditional forms of media such as vinyl records and cassette tapes, while digital media includes modern formats such as MP3 files and digital video.

2. What do you mean by data compression?(C5) What are its types?(C5) Describe JPEG data compression.(C5)

Data compression is the process of reducing the amount of space required to store a piece of data. This is achieved by encoding the data in a way that takes up less space than the original representation. Compression can be lossless or lossy, depending on whether or not the compressed data contains all of the information in the original data.

There are two types of data compression:

Lossless Compression: In lossless compression, the compressed data can be fully restored to its original form without any loss of information. This type of compression is used when it is necessary to retain all of the original data.

Lossy Compression: In lossy compression, some data is lost during the compression process, resulting in a smaller file size. This type of compression is used when a small loss of data is acceptable in exchange for a significant reduction in file size.

JPEG data compression is a commonly used lossy compression algorithm for digital images. JPEG stands for Joint Photographic Experts Group, which is the organization that developed the algorithm. The JPEG compression algorithm works by dividing the image into small 8x8 pixel blocks, and then performing a mathematical transformation on each block to reduce the amount of data required to represent it. The transformed data is then quantized, which further reduces the amount of data by rounding off some of the values. Finally, the compressed data is encoded using Huffman coding, which assigns shorter codes to more frequently occurring values in the data.

The result of this process is a compressed image file that is significantly smaller than the original, but with some loss of detail and quality. The degree of compression and resulting loss of quality can be adjusted by changing the compression settings used during the encoding process.

3. Explore your view about multimedia communication system.(C3) Explain in detail about conferencing process over multimedia with required diagram if necessary.(C6)

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4. Describe magnetic media storage?(C8) Explain the level of RAID technology.(C8)

Magnetic media storage is a type of data storage that uses magnetization to store and retrieve data. It is the most common form of secondary storage used in computers, and it is used for storing data on hard disk drives (HDDs), floppy disks, and magnetic tape.

In a magnetic storage device, data is stored as magnetic fields on a thin layer of ferromagnetic material. These fields are arranged in patterns that represent digital information. The device uses read/write heads to access the data by changing the magnetic fields in the material. When data is written to the storage device, the read/write heads magnetize the material to represent the digital information. When data is read from the storage device, the read/write heads sense the magnetic fields and translate them back into digital information.

RAID (Redundant Array of Independent Disks) technology is a method of combining multiple hard disk drives (HDDs) into a single logical unit for data storage. The purpose of RAID is to improve data reliability and/or increase performance by spreading data across multiple disks. There are several levels of RAID, each with its own features and benefits:

RAID 0: This level stripes data across two or more disks for improved performance but offers no data redundancy.

RAID 1: This level mirrors data across two disks for data redundancy but offers no performance benefits.

RAID 5: This level stripes data across three or more disks for improved performance and provides data redundancy by using parity data.

RAID 6: This level is similar to RAID 5 but uses two sets of parity data for even greater data redundancy.

RAID 10: This level combines RAID 0 and RAID 1 by striping data across multiple mirrored pairs of disks, providing both improved performance and data redundancy.

Overall, the level of RAID technology used depends on the specific needs of the user or organization, such as performance, data redundancy, or a balance of both.

5. How Quality of Service (QoS) is measured in multimedia?(C7) Why is it so important?(C7)

The Quality of Service (QoS) in multimedia refers to the ability of a network to provide reliable and predictable performance for multimedia applications such as voice, video, and data. QoS can be measured based on several parameters, such as packet loss, delay, jitter, and throughput.

Packet loss is the percentage of packets that are lost during transmission, delay is the time taken by a packet to travel from the source to the destination, jitter is the variation in the delay of packets, and throughput is the amount of data transmitted over a network in a given period.

To measure QoS in multimedia, several metrics are used, such as Mean Opinion Score (MOS), Peak Signal-to-Noise Ratio (PSNR), Structural Similarity Index (SSIM), and Video Quality Metric (VQM).

MOS is a subjective metric that measures the perceived quality of the media content by the end-users. PSNR and SSIM are objective metrics that measure the quality of video signals by comparing the original signal with the received signal. VQM is another objective metric that compares the original video signal with the received signal and provides a score based on the similarity between the two signals.

QoS is crucial in multimedia because it ensures that the end-users receive a high-quality media experience. In multimedia applications, the delay, packet loss, and jitter can lead to a degraded user experience, resulting in the loss of business or customer dissatisfaction. Therefore, it is essential to measure and maintain QoS to ensure the reliability and predictability of multimedia applications.

6. What do you mean by computer animation?(C1) Describe the steps involved in the computer animation.(C1)

Computer animation is the process of creating animated visuals using computer software. It involves using digital tools and techniques to generate images that simulate motion and movement. Computer animation can be used for a variety of purposes, such as creating animated films, video games, visual effects for movies, or educational materials.

The steps involved in creating computer animation typically include:

Conceptualization: The first step in creating computer animation is to conceptualize the idea and the storyline of the animation. This involves defining the characters, the setting, the plot, and the message that the animation should convey.

Storyboarding: After conceptualizing the idea, the next step is to create a storyboard. A storyboard is a visual representation of the script, and it includes drawings or sketches of each scene and the action that takes place in each scene.

Modeling: Modeling is the process of creating the 3D models of the characters, objects, and environments that will be used in the animation. This involves using specialized software to create the models and to add texture, color, and other details.

Rigging: Rigging is the process of creating a virtual skeleton or structure for the 3D models. This is done so that the models can be animated and move realistically.

Animation: The next step is to animate the characters and objects in the scene. This involves creating keyframes that define the movements and actions of the characters and objects.

Lighting and Texturing: Once the animation is complete, the scene is lit and textured. This involves adding lighting effects and textures to the objects and environments to create a realistic look and feel.

Rendering: Rendering is the final step in creating computer animation. This involves using specialized software to generate the final image or sequence of images that make up the animation. The rendered images are then assembled into a final video or film.

7. Explain the process of multimedia over ATM network.(C10)

Asynchronous Transfer Mode (ATM) is a communication protocol that was designed to transfer a variety of data types, including multimedia, over high-speed networks. The process of transmitting multimedia over an ATM network involves several steps:

Compression: Multimedia files, such as audio and video, are often large in size. To transmit these files over a network efficiently, they are compressed into smaller sizes. There are several compression algorithms available, such as MPEG and JPEG, that are commonly used.

Segmentation: Once the multimedia files have been compressed, they are segmented into small packets. These packets are given a header that contains information about the packet, such as the source and destination addresses.

Routing: The packets are then routed through the ATM network based on the information in the packet headers. The routing is done using virtual circuits (VCs), which are established between the source and destination devices.

Switching: As the packets move through the network, they are switched from one ATM switch to another. The ATM switches use the information in the packet headers to determine the best path for the packets.

Reassembly: When the packets reach their destination, they are reassembled into their original format. The headers are removed, and the compressed multimedia files are decompressed back to their original size.

Playback: Once the multimedia files have been reassembled and decompressed, they can be played back on the destination device.

Overall, the process of transmitting multimedia over an ATM network involves compressing the files, segmenting them into packets, routing the packets through the network using VCs, switching the packets between ATM switches, reassembling the packets at the destination, and playing back the multimedia files.

Short Questions (4X5=20) = 60

8. How sound can be represented in multimedia system?(C3)

Waveform Representation: Sound can be represented as a waveform, which is a graphical representation of the sound's amplitude over time. The amplitude of the waveform represents the sound's volume, while the time axis represents the duration of the sound.

MIDI Representation: Sound can also be represented using the Musical Instrument Digital Interface (MIDI) protocol, which uses a series of digital instructions to describe the pitch, duration, and velocity of notes in a musical piece.

Digital Audio Representation: Sound can also be represented as digital audio, which involves sampling the sound wave at a specific frequency and then converting the analog signal into a series of digital values. These digital values can be stored as a series of binary digits and played back as audio using a digital-to-analog converter (DAC).

Overall, sound representation in multimedia systems relies on converting the physical sound wave into a digital format that can be stored, manipulated, and played back by a computer or other digital device.

9. What do you mean by sampling and quantization in multimedia?(C3)

In multimedia, sampling and quantization are two important processes used in the conversion of analog signals into digital signals.

Sampling refers to the process of taking measurements of an analog signal at regular intervals of time. In other words, the continuous analog signal is converted into a discrete digital signal by measuring its amplitude at specific intervals. The interval between each measurement is known as the sampling interval, and the number of measurements taken per second is known as the sampling rate. A higher sampling rate produces a more accurate representation of the original signal but also requires more storage space.

Quantization, on the other hand, refers to the process of assigning a digital value to each sample obtained from the analog signal during the sampling process. In other words, quantization involves mapping the continuous range of possible amplitude values of the analog signal onto a finite number of digital values. The number of possible digital values is determined by the number of bits used to represent each sample. The greater the number of bits used, the more accurate the representation of the analog signal but also requires more storage space.

Together, sampling and quantization play a crucial role in the conversion of analog signals to digital signals, which is important for the processing, transmission, and storage of multimedia data.

10. What do you understand by Multimedia in multimedia system?(C1)

Multimedia refers to the integration of different media types such as text, graphics, audio, video, and animation into a single digital content. In a multimedia system, these different types of media are combined to create an interactive and engaging experience for the user. The term "multimedia" is often used to describe applications, products, or services that use multiple media elements to convey information, entertain, educate, or communicate. Examples of multimedia systems include video games, digital art installations, educational software, and interactive presentations. The use of multimedia can enhance the effectiveness of communication by appealing to multiple senses and providing a more immersive experience.

11. Define Hypertext and Hypermedia.(C9) Describe about the classification of hypertext with suitable examples.(C9)

Hypertext refers to text that contains links or references to other texts, which can be accessed by the reader by clicking or selecting the link. Hypermedia extends hypertext to include other types of media, such as images, audio, and video, which can also be linked to other media or text.

Hypertext can be classified into three types:

Internal Hypertext: Internal hypertext contains links to other parts of the same document or website. For example, a table of contents that links to different sections of a book or a webpage with links to different sections on the same webpage.

External Hypertext: External hypertext contains links to other documents or websites. For example, a webpage that links to related articles or a blog post that links to external sources.

Mixed Hypertext: Mixed hypertext contains both internal and external links. For example, an academic paper that references external sources while also linking to different sections within the same paper.

Hypermedia can also be classified into three types:

Linear Hypermedia: Linear hypermedia is presented in a predefined sequence, and the user can only navigate forward or backward through the sequence. For example, a video that plays in a predetermined sequence.

Non-linear Hypermedia: Non-linear hypermedia allows the user to navigate freely between different sections or media types. For example, a website with links to different articles or a video game with multiple paths and outcomes.

Mixed Hypermedia: Mixed hypermedia combines elements of both linear and non-linear hypermedia. For example, an interactive video that allows the user to make choices that affect the outcome of the video.

12. Write short notes on:
    a. Error resilience(C7)
    b. Disk spanning(C8)

a. Error resilience refers to the ability of a system or data to recover from errors or failures without losing important information or functionality. In the context of digital communications, error resilience techniques can include error detection and correction codes, packet retransmission, and data redundancy. These techniques help to ensure that data can be transmitted and received reliably, even in the presence of noise, interference, or other sources of error. Error resilience is especially important in critical applications such as medical monitoring, industrial control systems, and military communications, where the consequences of data loss or corruption can be severe.

b. Disk spanning is a technique used to store large files or data sets across multiple physical storage devices, such as hard drives, DVDs, or flash drives. This technique can be used to overcome limitations in the capacity of individual storage devices and to create larger, more flexible storage systems. In disk spanning, the file or data set is divided into smaller parts, which are then stored across multiple disks. When the file or data set is accessed, the system retrieves the necessary parts from each disk and reassembles them into the complete file or data set. Disk spanning can be implemented at the software or hardware level and is commonly used in backup and archiving applications. However, disk spanning can also introduce additional complexity and potential points of failure, as the system must manage multiple disks and ensure that all parts of the file or data set are available and accessible.
External 2010

Long Questions (5X12=60)

1. What is multimedia?(C1) Discuss the main properties of multimedia system and global structure of multimedia system.(C3)

Definition of Multimedia:
Multimedia refers to the integration of various forms of media such as text, graphics, audio, video, and animation into a single digital format. Multimedia technology is used in a variety of applications including education, entertainment, communication, and business. A multimedia system typically includes hardware and software components that enable the creation, storage, retrieval, and manipulation of multimedia content.

Properties of Multimedia Systems:
A multimedia system has the following properties:

Integration: Multimedia systems combine different media types to create a cohesive whole. This integration enables the creation of interactive and engaging content.

Interactivity: Multimedia systems allow users to interact with the content in various ways, such as by clicking on links, buttons, or menus.

Time-synchronization: Multimedia systems synchronize different media types with time, such as video and audio, to create a seamless experience.

Compression: Multimedia systems use compression techniques to reduce the size of multimedia files without compromising quality.

Delivery: Multimedia systems deliver content through various channels, such as the internet, DVDs, CDs, or other storage media.

Scalability: Multimedia systems can handle different levels of complexity, from simple text and graphics to complex animations and video.

Compatibility: Multimedia systems ensure that the content can be accessed on different devices and platforms, such as computers, tablets, and smartphones.

Global Structure of Multimedia Systems:
The global structure of a multimedia system typically consists of the following components:

Input Devices: These devices capture multimedia content, such as cameras for capturing images or videos, microphones for recording audio, and scanners for digitizing documents.

Processing Devices: These devices process multimedia content, such as computers, workstations, or servers.

Storage Devices: These devices store multimedia content, such as hard drives, flash drives, or CDs/DVDs.

Output Devices: These devices display or play multimedia content, such as monitors, projectors, speakers, or headphones.

Communication Networks: These networks transmit multimedia content between devices, such as the internet, LANs, or WANs.

Application Software: This software enables the creation, editing, and playback of multimedia content, such as video editors, audio editors, and multimedia players.

In summary, a multimedia system is a complex system that integrates various media types into a cohesive whole. It has properties such as interactivity, time-synchronization, and scalability, and includes components such as input devices, processing devices, storage devices, output devices, communication networks, and application software.

2. What is digital image?(C3) How they are acquired?(C3) Discuss about the digital image representation.(C3)

A digital image is a representation of a two-dimensional visual information in a digital format. It is a collection of pixels (picture elements) arranged in rows and columns to form an image. Each pixel contains a value that represents the color or brightness of a specific point in the image. Digital images can be created, edited, stored, and transmitted using digital devices and computer software.

Digital images can be acquired using various devices such as digital cameras, scanners, and medical imaging equipment like MRI and CT scanners. These devices capture the image using sensors that convert the light or other forms of energy into digital signals. The digital signals are then processed by the device and stored as a digital file.

The digital image representation involves encoding the image data into a digital format that can be processed and stored by a computer. The most common format used for digital images is the raster format, which represents the image as a grid of pixels. Each pixel is assigned a value that corresponds to its color or brightness.

In raster format, there are several file formats used for digital images such as JPEG, PNG, GIF, and BMP. Each of these formats uses a different algorithm for compressing and storing the image data, which affects the quality and size of the digital image file.

Another format used for digital images is the vector format, which represents the image using mathematical equations and geometric shapes. Vector images are scalable and can be resized without losing quality, making them ideal for logos and illustrations.

In summary, digital images are a two-dimensional representation of visual information stored in a digital format. They can be acquired using various devices and are represented using different file formats.

3. What is MPEG?(C5) Describe different types involved in MPEG compression.(C5)

MPEG, which stands for Moving Picture Experts Group, is a standard for video and audio compression that was developed by the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). The goal of MPEG is to provide a standardized method for compressing digital audio and video data so that it can be easily transmitted and stored.

There are several different types of MPEG compression, each with its own specific characteristics and applications:

MPEG-1: This is the first standard in the MPEG series and was primarily designed for compressing video and audio for CD-ROM. MPEG-1 can achieve compression ratios of up to 200:1, making it ideal for low-bandwidth applications such as video on demand and streaming media.

MPEG-2: This standard was designed for digital television and DVD video. MPEG-2 can achieve higher compression ratios than MPEG-1, up to 400:1, while maintaining high-quality video and audio.

MPEG-4: This standard is designed for multimedia applications and can handle a wide range of audio and video formats, including 3D graphics and virtual reality. MPEG-4 can achieve compression ratios of up to 1,000:1.

MPEG-7: This standard is designed for multimedia content description and provides a standardized way of describing audio and video content, making it easier to search for and retrieve specific content.

MPEG-21: This standard is designed for multimedia framework and provides a standard way of managing and distributing multimedia content across different devices and networks. MPEG-21 is designed to support a wide range of applications, from digital rights management to content delivery and interactive multimedia.

4. A data system has only five symbols MNOPQ with the following probabilities: p(M)=0.16, p(N)=0.51, p(O)=0.09, p(P)=0.13, p(Q)=0.11. Construct a Huffman code tree from the above data and find out the resultant code word for each symbol. (C5)
5. Discuss hot RTP (Real-time Transport Protocol) and RTCP (Real-Time Control Protocol) works in multimedia communication and the Internet. (C6)

Real-time Transport Protocol (RTP) and Real-time Control Protocol (RTCP) are two important protocols used in multimedia communication over the internet.

RTP is a protocol used to transmit real-time multimedia data, such as voice and video, over IP networks. It is used to carry audio and video content and is designed to provide end-to-end transport functions for applications transmitting real-time data. RTP usually runs on top of UDP and provides timestamps and sequence numbers to ensure that the data is delivered in the correct order and with the correct timing.

RTCP, on the other hand, is a protocol that works in conjunction with RTP to provide feedback on the quality of the transmitted data. RTCP is responsible for transmitting control information about RTP packets that helps to monitor the quality of the data sent and received. It provides feedback to the sender, allowing them to adjust the transmission rate, codec, and quality of the media stream in real-time.

RTP and RTCP work together to deliver real-time multimedia content over IP networks. RTP transmits the actual data, while RTCP works in the background to monitor the quality of the transmitted data and

provide feedback to the sender. Together, these two protocols provide a reliable and efficient way to transmit multimedia content over the internet.

6. What is RAID?(C8) Describe RAID Level-0 and RAID Level-1 representation.(C8) 7. Write short notes on any THREE:
    a. Hypertext and Hypermedia(C9)
    b. Disk Spanning(C8)
    c. In-between process in animation(C1)
    d. Challenges for multimedia system(C3)

6. RAID stands for Redundant Array of Independent Disks. It is a technological approach in which multiple hard drives are integrated to achieve better performance, reliability, and capacity compared to a single disk.

RAID Level-0 is a type of RAID in which data is stored across multiple disks, without any redundancy or error correction. It provides increased performance by allowing parallel read/write operations. However, it doesn't provide any fault tolerance, meaning if one of the disks fails, all data is lost.

RAID Level-1 is a type of RAID in which data is mirrored across two identical drives. It provides data redundancy, meaning if one drive fails, data is still available on the other drive. However, it offers no performance benefits as both drives are storing the same data.

7. Short Notes on:

a. Hypertext and Hypermedia - Hypertext refers to text that contains links to other texts, allowing users to quickly navigate to related information. Hypermedia expands on the concept of hypertext by including multimedia content such as images, videos, and audio. It enables users to interact with multimedia content through links.

b. Disk Spanning - Disk spanning is a technique that enables large files or data to be distributed over multiple disks. In other words, it allows multiple disks to appear as a single logical volume. Disk spanning can help increase storage capacity, but may also introduce the risk of data loss if one disk fails.

c. In-between process in animation - In-betweening is a process in animation in which intermediate frames are created between two keyframes to achieve smooth motion. It helps to create the illusion of movement and motion when a series of static images are shown in sequence.

d. Challenges for multimedia system - Some of the key challenges for multimedia systems include managing large amounts of data, ensuring interoperability across different platforms and devices, addressing security and privacy concerns, and maintaining quality of service (QoS) for multimedia content delivery.

Short Questions (4X5=20)

8. Discuss about the hardware and software used for digital representation of sound.(C3)

Digital representation of sound involves the conversion of analog sound waves into digital signals that can be stored and manipulated digitally. This is done using hardware and software tools designed for this purpose.

Hardware:

1. Analog to Digital Converter (ADC): This device is used to convert the analog sound wave into digital signals that can be understood by the computer. It measures the waveform of the analog signal and then samples this data at regular intervals, converting each sample into a numerical value.

2. Microphones: Microphones are used to capture the analog sound waves and convert them into an electrical signal that can be processed by the ADC.

3. Speakers: Speakers are used to reproduce sound from the digital signals. The digital signals are converted back to analog signals and amplified to drive the speakers.

Software:

1. Digital Audio Workstation (DAW): A digital audio workstation is software used for recording, editing, and mixing digital audio. It allows for precise editing, mixing, and manipulation of recorded sound.

2. Audio Editors: Audio editors are software tools that allow for editing of digital audio files. They can be used for removing background noise, adjusting levels, adjusting pitch, and many more.

3. Audio Players: Audio players are software tools that play digital audio files. They can be used for listening to music or podcasts, and other forms of digital audio.

4. Audio Codecs: Audio codecs are software tools that encode and decode digital audio files. They are used for compressing large digital audio files into smaller ones for efficient storage and transmission, while maintaining the quality of the audio.

Overall, the hardware and software tools for digital representation of sound are essential for activities such as music production, podcasting, and audio broadcasting. They enable high-quality, efficient storage, and transmission of digital audio files.

9. What is image resolution?(C3) Find out the size of 640x480 4-bit color image.(C3)

Image resolution refers to the number of pixels (or dots) that make up a digital image. The higher the resolution, the more pixels there are per unit of measurement, resulting in a clearer and more detailed image.

A 640x480 4-bit color image has a total of 307,200 pixels (640 x 480 = 307,200). The "4-bit" part of the question refers to the color depth of the image, which means it can only display a total of 16 different colors.

To find out the size of the image in kilobytes (KB), you would need to know the file format and compression type used to store the image. Without this information, it's impossible to accurately determine the file size.

10. What is multimedia document?(C3) Briefly describe the document architecture and document structure.(C3)

A multimedia document is a type of document that contains multiple forms of media such as text, graphics, audio, video, and animation. It is a combination of different media elements to convey a message or provide information to the users.

The document architecture refers to the overall design and organization of a multimedia document. It includes the principles, guidelines, and standards that are used to create and manage multimedia documents. This architecture ensures that the different media elements are integrated into the document in a cohesive and effective way.

The document structure, on the other hand, refers to the arrangement and organization of the different media elements within the multimedia document. It includes the hierarchy of the documents, the layout and placement of the different media elements, and the navigation features that allow users to move between different sections of the document.

In summary, the document architecture sets the guidelines for the creation of a multimedia document, while the document structure determines how the different media elements are arranged and organized within the document.

11. What is communication channel?(C2) Describe the basic data communication model.(C2)

A communication channel is a pathway through which data is transmitted from one device to another. It can be physical, such as copper wires, fiber optics, or wireless signals, or it can be virtual, such as email or instant messaging.

The basic data communication model consists of three main components: the sender, the receiver, and the channel. The sender is the device that initiates the transmission of the data, and the receiver is the device that receives the data. The channel is the pathway through which the data is transmitted.

The data communication model also includes two other components: the protocol and the message. The protocol is the set of rules that governs how the data is transmitted, while the message is the data that is being transmitted.

The process of data communication occurs in the following steps:

1. The sender encodes the message into a format that can be transmitted over the communication channel.
2. The encoded message is transmitted over the channel.
3. The receiver decodes the message and processes it as necessary.

During this process, there may be errors introduced, such as noise or interference, which can affect the quality of the transmitted data. In order to minimize these errors, various protocols and techniques are used, such as error detection and correction codes.

12. Why data and file format standardization is crucial?(C4) What are the key information carried in RTF files?(C3) Explain.

Data and file format standardization is crucial for several reasons:

1. Interoperability - Standardizing data and file formats ensures that different systems can communicate with each other seamlessly. This is especially important when it comes to data exchange between different companies or organizations.

2. Efficiency - Standardized data and file formats can increase efficiency in data processing and reduce errors caused by format incompatibility.

3. Security - Standardizing file formats can also enhance security by enabling the use of encryption and other security measures across different systems.

RTF (Rich Text Format) files carry text and formatting information. Some of the key information carried in RTF files includes:

1. Font information - RTF files can specify the font used for text, including font size, color, and style (bold, italic, underline).

2. Paragraph formatting - RTF files can specify line spacing, indentation, and alignment for paragraphs.

3. Graphics - RTF files can include graphics such as images and charts.

4. Tables - RTF files can also handle tables, specifying column and row data, borders, and shading.

Overall, RTF files are versatile and widely used for transferring text and information across different systems.

13. Briefly describe some application areas of multimedia system.(C3)
    Multimedia systems have various application areas, some of which are:

    1. Entertainment - Multimedia systems are widely used in the entertainment industry, such as movies, music, and video games.

    2. Education - Multimedia systems are used in education to enhance the learning process through interactive content, presentations, and simulations.

    3. Advertising - Multimedia systems are used in advertising to create engaging and interactive ads that attract more customers.

    4. Teleconferencing - Multimedia systems are used in teleconferencing for remote communication through video, audio, and text messaging.

    5. Medical - Multimedia systems are used in the medical field for patient education, diagnostic imaging, and surgical training.

    6. Virtual Reality - Multimedia systems are used in virtual reality applications for gaming, simulations, and training.

    7. E-commerce - Multimedia systems are used in e-commerce to provide engaging product descriptions and demonstrations.

    8. Art and Design - Multimedia systems are used in art and design for creating interactive installations and digital media artworks.

External 2009

Long Questions

1. What is digital image?(C3) How an image if represented digitally? Explain.(C3)

A digital image is an electronic representation of a visual image that is stored as a collection of binary data. It is created by converting an analog image, such as a photograph or drawing, into digital format using a digital camera or a scanner.

To represent an image digitally, the image is first divided into tiny units called pixels (short for picture elements). Each pixel is assigned a numerical value that corresponds to its color and brightness. These numerical values are then converted into binary code, which is a series of 0s and 1s that can be stored in a digital file format such as JPEG, PNG, or GIF.

The resolution of a digital image is determined by the number of pixels per inch (ppi) or dots per inch (dpi), which affects the image's quality and sharpness. The higher the resolution, the more detail is captured in the image.

Overall, digital images have become an essential part of our lives, from personal photos to scientific research and medical imaging. They have revolutionized the way we capture, store, and share visual information.

2. A data stream has only five symbols ABCDE with the following probabilities: p(A)=0.10, p(B)=0.36, p(C)=0.15, p(D)=0.20, and find out the resultant code word for each symbols.(C5)

   To find the code word for each symbol, we need to use the Huffman coding algorithm:

   1. Arrange the symbols in descending order of their probabilities:

   b -> 0.36
   d -> 0.20
   c -> 0.15
   a -> 0.10
   e -> 0.19

   2. Combine the two symbols with the lowest probabilities and merge them into a new symbol with a probability equal to the sum of their probabilities:

   b & e -> 0.36 + 0.19 = 0.55
   d -> 0.20
   c -> 0.15
   a -> 0.10

   3. Repeat step 2 until all the symbols are combined into a single code word:

b & e -> 0.55
d & c -> 0.35
b, e, d & c -> 1.0
a -> 0

4. Assign 0s and 1s to each branch of the merging process, where 0 goes to the left branch and 1 goes to the right branch:

b & e -> 0
d & c -> 1
b -> 00
e -> 01
d -> 10
c -> 11
a -> None (as it was not merged)

Therefore, the resultant code word for each symbol is:

a -> None
b -> 00
c -> 11
d -> 10
e -> 01

3. What is RAID?(C8) Explain RAID Level-0 and RAID Level-1 in detail.(C8)

In the context of computer data storage, RAID (Redundant Array of Inexpensive Disks) refers to a set of techniques for improving the performance, reliability, and capacity of storage systems by combining multiple disks into a single logical unit.

RAID Level-0:
RAID Level-0, also known as striping, is the simplest and fastest RAID configuration. In this configuration, data is spread across multiple disks in fixed-size chunks or stripes. By distributing the data in parallel across the disks, RAID Level-0 can provide excellent read and write performance, enhancing system speed. However, RAID Level-0 does not provide any fault tolerance, and a single disk failure can lead to data loss.

RAID Level-1:
RAID Level-1, also known as mirroring, provides redundancy by keeping a copy of the data on multiple disks. In this configuration, two physical drives are paired together, and all data is written to both drives simultaneously. If one drive fails, the system can continue to operate normally without any loss of data,

as all data is still available on the second drive. This provides excellent data protection, but it also means that the available storage capacity is limited to half of the total drive capacity.

In summary, while RAID Level-0 offers better performance, it does not provide any fault tolerance, and a single disk failure can lead to data loss. On the other hand, RAID Level-1 provides excellent data protection, but storage capacity is limited and performance is slower than RAID Level-0.

4. What is JPEG?(C5) Describe JPEG compression process.(C5)

JPEG stands for Joint Photographic Experts Group, which is a commonly used image file format for storing digital photos. The JPEG compression process is a technique that reduces the file size of an image by removing redundant or irrelevant information from the image file. This process makes the image file more compact and takes up less space on disk, while also retaining a high level of visual quality.

The JPEG compression process involves several steps, including:

1. Breaking the image into small squares called "blocks."
2. Converting each block from the RGB (Red, Green, Blue) color space to the YUV (Luminance, Chrominance) color space.
3. Dividing the chrominance information in each block by a factor of two, which reduces the amount of data required to store the image.
4. Applying a mathematical formula called Discrete Cosine Transform (DCT) to each block to convert the remaining color and brightness information into a compressed form.
5. Quantizing the compressed data according to a set of predefined tables to further reduce file size.
6. Encoding and storing the compressed data in a JPEG file format.

Overall, the JPEG compression process is a great way to reduce file size while retaining high-quality images, which is why it is widely used in digital photography and other image-based applications.

5. Discuss Resource Reservation Protocol (RSVP) and Real Time Streaming Protocol (RTSP) used in multimedia communication system.(C6)

Resource Reservation Protocol (RSVP) and Real Time Streaming Protocol (RTSP) are two important protocols used in multimedia communication systems.

RSVP is a signaling protocol that is used to reserve network resources in order to support Quality of Service (QoS) for real-time multimedia applications such as video conferencing and video streaming. It enables prior reservation of network resources before data transmission, which ensures that sufficient bandwidth is available for the specific communication session. RSVP controls the flow of data to the receiver and allows for the receiver to make decisions on how to handle the data in real-time. RSVP reservation can be of two types: soft state, where the reservation is held for a definite period of time, and hard state, where the reservation is held until the end-user releases it.

RTSP, on the other hand, is a protocol that is used for establishing and controlling media sessions between end-points. It enables real-time streaming of audio and video between the server and the client. RTSP is used to deliver on-demand or live media streams, such as live television broadcasts, videoconferencing, and online gaming. RTSP uses the same ports as HTTP, and is often used in combination with RTP (Real-time Transport Protocol) and RTCP (Real-time Control Protocol).

Both RSVP and RTSP play a critical role in ensuring that multimedia communication systems are delivered in a timely and reliable manner, with superior quality of service.

6. Explain the advantage and disadvantages of personal selling.(C9) 7. Write short notes:
    a. Hypertext and Hypermedia (C9)
    b. Emerging multimedia technologies (C11)
    c. Multimedia over Internet (C9)
    d. In-between process in animation (C1)

6. Personal selling refers to the process of face-to-face communication between a sales representative and potential customers. The advantages of personal selling include:

- Building strong relationships: Personal selling allows sales representatives to build personal relationships with customers, which can lead to increased customer loyalty and repeat business.
- Customization: Personal selling allows sales reps to tailor their sales message to the specific needs of each customer, increasing the likelihood of a successful sale.
- Immediate feedback: Sales reps can receive immediate feedback from customers, allowing them to quickly adjust their sales approach if necessary.
- High level of control: Sales reps have a high degree of control over the sales process, allowing them to guide customers to a decision.

The disadvantages of personal selling include:

- Cost: Personal selling is typically more expensive than other forms of marketing, due to the cost of hiring and training sales reps.
- Limited reach: Personal selling is a time-consuming process and can only target a limited number of customers at a time.
- Inconsistent messaging: Due to the high degree of control that sales reps have over the sales process, the messaging can be inconsistent across different reps.
- Potential for misrepresentation: There is always the risk that sales reps may misrepresent a product or oversell its benefits to close a sale.

7. Short notes:

a. Hypertext and hypermedia: Hypertext is a text-based linking system that allows for non-linear navigation through interconnected information. Hypermedia is a multimedia version of hypertext that includes links to images, video, sound, and other multimedia content. Both are important concepts in the world of multimedia and digital communication.

b. Emerging multimedia technologies: Emerging multimedia technologies are new and innovative methods of delivering multimedia content, such as virtual reality, augmented reality, and interactive installations. These technologies are constantly evolving and expanding, providing new ways for people to engage with multimedia content.

c. Multimedia over the internet: Multimedia over the internet refers to the delivery of multimedia content, such as video and audio, over the internet. This can include streaming services, online video platforms, and multimedia messaging.

d. In-between process in animation: The in-between process in animation refers to the process of creating frames between key frames to create a smooth animation sequence. This process involves filling in the gaps between the keyframes to create a seamless animation.

Short Answers

8. What is RTF (Rich Text Format)?(C3) what are the key information carried in RTF files? Explain. (C3)

RTF (Rich Text Format) is a file format used for exchanging formatted text documents between different word processors and applications. It is a proprietary document file format developed by Microsoft Corporation.

The key information carried in RTF files includes text formatting information such as fonts, font size, text color, bold, italic, underline, alignment, indentation, paragraph spacing and page formatting like page margins, header/footer, and page orientation.

Other key information that can be carried in RTF files are embedded objects such as images, audio and video files, as well as hyperlinks, tables, symbols, and special characters.

RTF files are useful for exchanging text documents between different operating systems and different word processing software because they contain text formatting information and document layout information that can be read by various applications.

9. Write the process of representing the image in digital form?(C3) 10. Explain about the processes of digital representation of audio signal.(C3) 11. Write short notes on:
    a. Packetization(C6)
    b. Multimedia conference(C6)

9. The process of representing the image in digital form involves taking a physical image and converting it into a sequence of binary code that a computer can understand. This is done through a process called sampling, where the image is broken down into tiny pixels, and the color of each individual pixel is assigned a specific numerical value. The sampling rate used will determine the level of detail captured in the image, with higher sampling rates resulting in more detailed images but also larger file sizes. Once

the image has been sampled, the numerical values are converted into binary code and stored in a digital file format such as JPEG or PNG.

10. The process of digital representation of an audio signal involves taking a continuous analog waveform and converting it into a series of digital samples. This is done through a process called analog-to-digital conversion (ADC), where the analog signal is measured and quantized at regular intervals to produce a series of discrete digital values. The sampling rate used will determine the level of detail captured in the audio signal, with higher sampling rates resulting in more accurate reproductions of the original waveform. Once the audio has been sampled and digitized, it can be stored in a digital file format such as MP3, WAV, or AAC.

11.
a. Packetization refers to the process of breaking down data into smaller units called packets for transmission over a network. This enables more efficient data transfer, as packets can be routed separately and in parallel, and also allows for error detection and correction. Each packet contains a portion of the data along with addressing and control information, and is reassembled into the original data stream at the receiving end.

b. Multimedia conference refers to a form of communication that allows multiple users to share audio, video, and other multimedia content in real-time over a network. This can be done through various technologies such as video conferencing software, web conferencing platforms, or virtual meeting rooms. Multimedia conferencing enables remote collaboration, distance learning, and virtual events, and can be used for a wide range of purposes including business meetings, educational seminars, and social gatherings.