

Multimedia

Short Notes

One Shot Revision | Hindi + English

1

Multimedia Basics

Definition • Components • Linear vs Non-Linear • Applications

2

Hardware, Software & Storage

Multimedia Hardware • Software Types • CD-ROM • DVD • CD vs DVD

3

Multimedia Audio & Text

Sampling • Bit Depth • MP3 • MIDI • Audio Formats • Types of Text

4

Graphics & Digital Imaging

RGB / CMYK • Pixel • Resolution • Raster vs Vector • Image Formats • Scanner vs Camera

5

Animation & Video

Keyframe • Tweening • FK / IK • Morphing • NTSC / PAL / SECAM • Compression • Video Production

6

Multimedia Project & Future

8 Stages • Design • Authoring • Team • Interactive TV • Digital Broadcasting • Conferencing

Multimedia (बहुमाध्यम)**Definition**

Multimedia is the combination of **two or more types of media** such as text, graphics, audio, video, animation and images to present information in an interactive or non-interactive form.

Multimedia ऐसी तकनीक है जिसमें दो या दो से अधिक प्रकार के माध्यमों जैसे Text, Graphics, Audio, Video, Animation और Images को मिलाकर सूचना प्रस्तुत की जाती है। **Example:** Educational app जिसमें text, image, video, audio और animation हो।

EXAM POINT Multimedia = Multiple Media + Information Presentation

Components of Multimedia (प्रमुख घटक)

Component	हिन्दी	Meaning	Example
Text	पाठ	Written information दिखाने के लिए	Headings, paragraphs, captions; chapter का text
Graphics	ग्राफिक्स	Visual representations जो information समझना आसान बनाते हैं	Charts, diagrams, logos; Geography lesson में map
Image	चित्र	Digital pictures	-
Audio	ध्वनि	Sound या voice	Voice narration, music, sound effects; Online class में teacher की voice
Video	वीडियो	Moving images की sequence, आमतौर पर sound के साथ	Educational video, movie, tutorial; YouTube tutorial
Animation	एनिमेशन	Images/objects की series दिखाकर movement का appearance	Solar System की animated explanation; पृथ्वी के सूर्य के चारों ओर घूमने का demonstration

Classification of Multimedia

Feature	Linear Multimedia	Non-Linear Multimedia
Meaning	User का presentation sequence पर बहुत कम या कोई control नहीं ; content beginning से end तक चलता है	User content के अलग-अलग भागों में अपनी ज़रूरत के अनुसार navigate कर सकता है
User Control	Low / No	High
Sequence	Fixed	Flexible
Interaction	Low	High
Navigation	Limited	User controlled
Example	Movie, Television program, Automatic presentation	Interactive website, Interactive educational software, Computer-based training, Interactive presentation

Multimedia Applications (अनुप्रयोग)

Field	Use / Examples
Education (शिक्षा)	Smart classes, E-learning, Online courses, Educational animations, Digital textbooks
Entertainment (मनोरंजन)	Movies, Games, Music, Animation, OTT platforms (video game = graphics + sound + animation + video)
Business (व्यवसाय)	Presentations, Product demonstrations, Advertisements, Training, Video conferencing
Medicine (चिकित्सा)	Medical simulation, 3D anatomy, Medical training videos, Diagnostic visualization
Advertising (विज्ञापन)	Digital advertising, e.g. YouTube ad जिसमें video, audio, text और animation
Science & Engineering	Simulations, 3D models, Scientific visualization, Training systems
E-Commerce	Product images, Product videos, 360° views, Audio/video demonstrations
Communication	Video conferencing, Online meetings, Webinars, Social media

2 Hardware, Software & Storage

Multimedia Hardware

Definition

वे **physical devices** जिनकी सहायता से multimedia content को create, store, process, display और reproduce किया जाता है।

Hardware	Function
Computer / PC	Main processing device: audio/video processing, image editing, multimedia software चलाना, files store करना
Monitor / Display	Text, images, graphics, video, animation दिखाता है (LCD, LED, OLED)
Speakers	Electrical audio signals को audible sound में बदलते हैं
Microphone	Sound → Electrical Signal (Voice recording)
Camera	Images और video capture (Webcam, digital camera)
Scanner	Physical document → Digital image
Projector	Computer output को बड़ी screen पर दिखाता है (Classroom presentation)
Sound Card	Audio signals process: audio input, output, recording, playback
Graphics Card / GPU	Graphics, images, animation और video को process और render (Gaming, 3D animation, video editing)
Storage Devices	HDD, SSD, USB Flash Drive, Memory Card, CD, DVD (multimedia files को ज़्यादा storage चाहिए)

Multimedia Software

Definition

वे programs जिनका उपयोग multimedia content को **create, edit, process, manage, present और play** करने के लिए किया जाता है।

Type	Examples	Uses
Image Editing	Adobe Photoshop, GIMP, CorelDRAW	Cropping, color correction, image manipulation, graphic design
Audio Editing	Audacity, Adobe Audition	Recording, cutting, mixing, noise reduction
Video Editing	Adobe Premiere Pro, DaVinci Resolve, Final Cut Pro	Cutting, joining, transitions, effects, audio synchronization
Animation	Blender, Adobe Animate	2D और 3D animations
Presentation	Microsoft PowerPoint	Text + Images + Audio + Video + Animation वाली presentations
Multimedia Player	VLC Media Player, Windows Media Player	Multimedia files play करना

CD-ROM & DVD

CD-ROM

Compact Disc Read-Only Memory: optical storage medium जिसमें digital data store और **read** होता है; standard CD-ROM में user data को modify/rewrite नहीं कर सकता। **Laser** से data read; read-only; portable। Capacity $\approx$ **700 MB**। पहले software, music albums और educational materials CD-ROM पर बँटते थे। **Exam Point:** **CD-ROM $\rightarrow$ Read Only**

DVD

Digital Versatile Disc (पुराने context में Digital Video Disc भी): optical storage medium जिसकी capacity CD से अधिक होती है।

Feature	CD	DVD
Full Form	Compact Disc	Digital Versatile Disc
Technology	Optical	Optical
Typical Capacity	~700 MB	4.7 GB or more
Laser	Laser	More advanced laser technology
Storage / Data Density	Lower	Higher
Uses	Music, software	Movies, software, games, backup, multimedia content

DVD Type	Approx. Capacity
DVD-5	4.7 GB
DVD-9	8.5 GB
DVD-10	9.4 GB
DVD-18	17 GB

TRICK CD < DVD | CD $\approx$ 700 MB, DVD $\approx$ 4.7 GB

3 Multimedia Audio & Text

Digital Audio

Digital Medium & Digital Audio

Digital medium में information **binary digits (0 और 1)** में represent होती है। Digital audio technology = sound को digital form में **record, store, edit और reproduce** करना। **Exam:** Analog Sound → Sampling & Quantization → Digital Audio।

PROCESS

Recording: Sound → Microphone → ADC → Digital Audio → Storage

Playback: Digital Audio → DAC → Speaker/Headphone → Sound

Term	Meaning
ADC	Analog-to-Digital Converter: analog signal को digital samples में बदलता है
DAC	Digital-to-Analog Converter: digital data को वापस analog signal में बदलता है
Sampling	Analog sound signal की amplitude को regular time intervals पर measure करना। एक second में लिए samples की संख्या = Sampling Rate / Frequency (unit Hz)। Example: CD-quality = 44.1 kHz = 44,100 samples/second । Higher rate → ज्यादा accurate, पर data size ज्यादा
Bit Depth	हर audio sample को represent करने के लिए कितने bits (8-bit, 16-bit, 24-bit)। Higher bit depth → amplitude ज्यादा accurate, dynamic range बढ़ती है

EXAM POINT Sampling Rate → Samples per second | Bit Depth → Bits per sample | Sound Card = Audio Input + Audio Processing + Audio Output

Audio Recording & Editing

Recording: Sound Source → Microphone → Sound Card/ADC → Digital Data → Storage (जैसे teacher का lecture)। **Editing operations:** Cut, Copy, Paste, Trim, Delete, Fade-in (आवाज़ धीरे-धीरे बढ़ना), Fade-out, Noise reduction, Volume adjustment, Mixing।

MP3, MIDI & Audio Formats

MP3

MPEG-1 Audio Layer III: popular **lossy** audio compression format; file size कम करने के लिए वह audio information हटाता/कम करता है जो मानव कान को कम सुनाई देती है। **Advantages:** small size, easy to store/transfer, widely supported।

Disadvantage: कुछ audio information discard। **Exam:** MP3 → Lossy

MIDI (Musical Instrument Digital Interface)

Technical **standard/protocol** जो electronic musical instruments, computers और devices के बीच musical performance information communicate करता है। **MIDI में actual recorded sound नहीं होती**; instructions होती हैं: कौन-सा note, कब, कितनी देर, कितनी velocity, कौन-सा instrument। Example: Play C note → Piano → Velocity 80 → Duration 1 second।

Feature	MIDI	Digital Audio
Nature	Musical instructions	Recorded sound
Actual sound stored?	Generally No	Yes
File size	Usually very small	Usually larger
Editing	Notes/instructions edit	Waveform/audio edit
Example	Piano note instructions	MP3 / WAV recording
Common use	Electronic music	Voice/music recording

VERY IMPORTANT **MIDI stores musical instructions, whereas digital audio stores the actual recorded sound.** Workflow: MIDI Keyboard/Controller → MIDI Data → Music Software → Synthesizer/Virtual Instrument → Sound (instrument piano से violin बिना दोबारा record किए बदला जा सकता है)।

Format	Type / Feature	Common Use
WAV	Waveform Audio File Format; usually uncompressed PCM ; high quality पर ज़्यादा storage	High-quality audio / editing
MP3	Lossy compressed	Music / distribution
AAC	Lossy compressed	Streaming / mobile
FLAC	Free Lossless Audio Codec: lossless compression (original data exactly वापस)	High-quality music
MIDI	Musical instructions	Electronic music
OGG	Compressed audio container/format family	Web / media

Adding Sound to a Project

Types: Voice narration, Background music, Sound effects, Alert sounds। **Steps:** 1) Audio record/obtain 2) Edit 3) Suitable format चुनना 4) Multimedia software में import 5) Text/video/animation से synchronize 6) Volume adjust 7) Final project test।

Text in Multimedia

Text

Multimedia का सबसे basic और महत्वपूर्ण component: information, heading, label, instruction और description देने के लिए। Examples: Heading, Paragraph, Menu, Caption, Button text, Navigation links।

Text Type	Meaning	Example
Static Text	Fixed रहने वाला text जो बदलता या move नहीं करता	Webpage की heading
Dynamic Text	Data, time या user interaction के अनुसार बदलने वाला text	Live score, digital clock, changing stock price
Hypertext	Text जिसमें hyperlinks होते हैं (दूसरे page/document/section पर जाने के लिए)	Website पर clickable link

EXAM POINT Hypertext → Text + Links

4 Graphics & Digital Imaging

Multimedia Graphics

Visual elements जिनसे information को visually present किया जाता है और application attractive बनती है: **Icons, Logos, Charts, Diagrams, Illustrations, Maps, Digital images**।

Coloring in Graphics

Color Model	Meaning	Use
RGB	Red + Green + Blue; additive color model	Electronic displays: monitors, TVs, mobile screens
CMYK	Cyan + Magenta + Yellow + Key/Black; subtractive color model	Printing

EXAM POINT RGB → Display / Screen | CMYK → Printing

Digital Imaging Fundamentals

Term	Meaning	Example
Digital Imaging	Images को digital form में create, represent, store और process करना; digital image बहुत छोटे elements pixels से बनती है	-
Pixel	Picture Element : digital image / display का सबसे छोटा addressable element	1920 × 1080 = 2,073,600 pixels
Resolution	Image में उपलब्ध detail , pixel dimensions में (higher pixels = ज्यादा detail; quality size, optics, compression पर भी depend)	1920 × 1080 pixels

Image Development & Editing

Development: digital image को create, capture या generate करना। **Editing**: existing image modify करना।

EDITING OPERATIONS Crop Resize Rotate Brightness Contrast Color correction Sharpening Blur
Background removal Adding text Applying effects

Raster vs Vector Graphics

Feature	Raster Graphics	Vector Graphics
Representation	Image को pixels की grid के रूप में	Mathematical descriptions (lines, curves, shapes) से
Examples	Photographs, Scanned images	Logos, icons, illustrations, diagrams
Formats	JPEG, PNG, GIF, BMP, TIFF	SVG, EPS
Scaling	-	बिना pixelation के scale हो सकता है

Format	Full Form	Feature	Common Use
JPEG / JPG	Joint Photographic Experts Group	Lossy compression	Photographs
PNG	Portable Network Graphics	Lossless , supports transparency	Web graphics
GIF	Graphics Interchange Format	Limited color palette, animation support	Simple animations
BMP	Bitmap	Generally uncompressed	Basic bitmap images
TIFF	Tagged Image File Format	High-quality image storage	Scanning / printing
SVG	Scalable Vector Graphics	Vector format	Logos / icons / web graphics

EXAM POINT PNG → Lossless + Transparency

Scanning & Digital Photography

Scanning

Physical document/photograph को **scanner** से digital image में convert करना (Physical Document → Scanner → Digital Image → Computer)। Example: paper certificate को PDF/image में save करना। **Factors:** Resolution, Color depth, Scan size, File format।

Digital Photography

Electronic **image sensor** से photographs capture करके digital form में store करना। **Components:** Camera lens, Image sensor, Processor, Storage, Display। **Formats:** JPEG, RAW, PNG।

Feature	Scanner	Digital Camera
Main Purpose	Documents/photos	Photographing scenes/objects
Capture Method	Scans a surface	Captures image through lens
Example	Scanning certificate	Taking a person's photograph
Output	Digital image/document	Digital photograph

Computer Animation

Definition

Images/frames की sequence तेज़ी से दिखाकर **movement का illusion** बनाने की technique। Example: गेंद को अलग-अलग frames में अलग position पर दिखाना।

Term	Meaning
Frame	Animation sequence की एक single image
Frame Rate	एक second में दिखाए जाने वाले frames की संख्या; unit FPS (Frames Per Second); 24 FPS = हर second 24 frames
Keyframe	Object की important position/state define करता है (Frame 1 → Ball at left, Frame 30 → Ball at right)
Tweening (In-between)	दो keyframes के बीच intermediate frames generate करना

EXAM POINT Keyframes define important states; Tweening creates intermediate frames.

Animation Technique	Meaning	Example
Frame-by-Frame	हर frame अलग-अलग बनाया जाता है	Traditional cartoon-style animation
Keyframe	सिर्फ important frames define; बीच के frames software बनाता है	-
Path-Based	Object एक predefined path पर move	Curved road पर car
Sprite	Sprite = 2D graphic object जो independently move/animate हो सकता है	2D games के characters
Motion Capture	Real person/object की movement sensors/ cameras से record करके digital character पर apply	Movies और games में 3D character animation

Kinematics	Meaning	Example
Kinematics	Objects की motion का study, forces पर ध्यान दिए बिना; animation में position, orientation, movement control	-
Forward Kinematics (FK)	Parent joint की movement से child joints की position तय होती है	Upper arm move → forearm और hand की position बदलती है
Inverse Kinematics (IK)	End point की desired position दी जाती है, software required joint positions calculate करता है	Robot hand को किसी point तक पहुँचना → arm joints की movement calculate

EXAM POINT **FK:** Parent/Joint movement → End position | **IK:** Desired End position → Required Joint movements

Morphing

Animation technique जिसमें एक image/object धीरे-धीरे दूसरी image/object में transform होती है (Face A → Gradual Transformation → Face B)। Uses: Movies, Advertisements, Special effects, Educational animations, Presentations।

Software	Common Use
Blender	3D modelling & animation
Adobe Animate	2D animation
Autodesk Maya	3D animation
3ds Max	3D modelling/animation
Toon Boom Harmony	2D animation

EXAM ASSOCIATION Blender → 3D | Adobe Animate → 2D | Maya → 3D Animation

Video Basics

How Video Works

Video **frames (still images) का sequence** है; frames को तेज़ी से display करने पर continuous movement का अनुभव होता है। Example: 30 FPS video = लगभग 30 frames हर second। **Frame rate** examples: 24, 25, 30, 60 FPS (higher frame rate = smoother motion, पर ज़्यादा data)।

Feature	NTSC	PAL	SECAM
Full Form	National Television System Committee	Phase Alternating Line	Séquentiel Couleur à Mémoire
Type	Analog TV	Analog TV	Analog TV
Traditional Association	USA, Japan और अन्य	India, Europe और अन्य	France और अन्य
Common Frame Rate	~29.97 FPS	25 FPS	25 FPS

EXAM POINT India → PAL (traditional analog TV standard); PAL → 25 FPS। ये traditional analog broadcast standards हैं; modern television broadcasting ज़्यादातर digital है।

Digital Video

Moving visual information का digital form: digital frames की sequence, अक्सर digital audio के साथ।

Components: Resolution, Frame rate, Color depth, Compression, Bit rate, Audio।

Term	Meaning	Example
Video Resolution	Video frame की pixel dimensions ; higher resolution = ज़्यादा pixels, ज़्यादा detail	1280×720 = HD; 1920×1080 = Full HD; 3840×2160 = 4K UHD
Video Compression	Video store/transmit करने के लिए data size कम करना: Lossy (कुछ information discard) / Lossless (original exactly)	H.264 / H.265 codecs
Bit Rate	प्रति unit time process/transmit होने वाला data (bps, Kbps, Mbps); higher bit rate = बेहतर quality पर ज़्यादा file size/bandwidth	-

Production Stage	Work
1. Pre-production	Planning before recording: Idea, Script, Storyboard, Location, Equipment, Budget
2. Production	Actual recording / shooting : Camera, Lighting, Microphone, Actors/presenters
3. Post-production	Editing after recording: Video editing, Audio editing, Transitions, Effects, Titles, Color correction, Rendering/export

EXAM TRICK Pre-production → Planning | Production → Shooting | Post-production → Editing

Video Editing Technique	Meaning
Cut	Unwanted portions हटाना या clips जोड़ना
Trim	Clip का beginning या end adjust करना
Transition	एक shot से दूसरे shot में जाते समय visual effect (Fade, dissolve)
Cropping	Frame के unwanted portions हटाना
Color Correction	Colors और exposure adjust
Audio Synchronization	Sound को video के साथ synchronize
Titles/Text	Headings, subtitles, captions जोड़ना
Special Effects	Visual effects जोड़ना

Video Format	Common Use
MP4	Web, mobile, streaming (video distribution के लिए common container)
AVI	Multimedia/video storage
MOV	Apple / QuickTime ecosystem
MKV	Flexible multimedia container
WebM	Web video
MPEG/MPG	MPEG-based video

Stages of a Multimedia Project

PROJECT FLOW

Idea → Planning → Design → Development → Authoring → Testing → Delivery → Maintenance

Stage	Work
1. Concept / Idea	Project का basic idea और objective तय करना
2. Planning	Scope, Target audience, Content, Resources, Timeline, Budget
3. Design	Interface, Navigation, Layout, Graphics, Storyboard
4. Development / Production	Text, Graphics, Audio, Video, Animation create और integrate
5. Authoring	Authoring software से multimedia elements को combine करना
6. Testing	Errors, Navigation, Audio/video synchronization, Compatibility, User experience
7. Delivery / Deployment	Completed project users को release
8. Maintenance	ज़रूरत पड़ने पर update और improve

Design, Authoring, Planning & Costing

Design Principles

Multimedia design का उद्देश्य information को clear, attractive और user-friendly तरीके से प्रस्तुत करना।

PRINCIPLES Simplicity Consistency Balance Contrast Alignment Navigation Readability
Appropriate use of color User interaction

Authoring

Text, graphics, audio, video और animation को **combine करके interactive multimedia application** तैयार करने की प्रक्रिया। **Exam: Authoring = Integrating multimedia elements into an application.**

Planning

Objectives, Target users, Content, Required hardware/software, Team, Schedule, Delivery method।

Costing

Hardware, Software licenses, Human resources, Recording equipment, Graphics/animation, Video production।

Multimedia Skills

SKILLS Graphic design Animation Audio recording/editing Video production/editing Programming
Web development UI/UX design Project management Content writing Storyboarding

Team Role	Responsibility
Project Manager	Project planning और coordination
Content Writer	Content / script
Graphic Designer	Graphics और visual design
Animator	Animation
Audio Specialist	Audio recording/editing
Video Specialist	Video production/editing
Programmer	Coding और functionality
UI/UX Designer	Interface और user experience
Subject Expert	Technical/subject content
Tester	Testing और quality assurance

Looking Towards the Future

Topic	Details
Digital Communication & New Media	Digital technologies और networks से information exchange; New media = internet-based और interactive communication। Examples: Social media, Websites, Streaming platforms, Podcasts, Online news, Video sharing, Digital advertising
Interactive Television	Viewers सिर्फ देखते नहीं, content के साथ interact करते हैं। Features: Interactive menus, On-demand content, Electronic program guides, Voting, Information services, Interactive advertisements। Example: on-screen menu से movie चुनकर on demand देखना
Digital Broadcasting	TV/radio content को digital form में transmit। Advantages: बेहतर picture और sound quality, spectrum का efficient उपयोग, multiple channels, additional data services
Digital Radio	Audio को digital signals से transmit; analog radio से बेहतर audio quality और additional information services (audio के साथ text/program information)
Multimedia Conferencing	अलग locations के लोग audio, video, text, screen sharing, file/data sharing से communicate। Examples: Video conference, Online classroom, Web meeting, Telemedicine consultation, Virtual business meeting

BASIC REQUIREMENTS (Conferencing) Camera + Microphone + Speakers + Network + Conferencing Software